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THE
NEWS
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COMPUTER **EXPRESS**

Issue 116 • 26 January 1991 • 70p

FIRST NEWS • FIRST REVIEWS • BEST BUYS • YOUR WEEKLY GUIDE

THIS WEEK

AMIGA

PageStream 2 is here — but is it the best Amiga DTP package you can buy?

ATARI

It's cheaper and better — Lynx 2 arrives at Las Vegas

PC

Where can you get a 286 with a laser printer for less than £1,000?

ARCHIMEDES

Hypermedia for only £39!

CPC

Fancy a 24Mb hard drive?

GAMERS

**REGULAR TIPS
& TRICKS FOR
MEGADRIE
NINTENDO
ATARI LYNX
GX-4000**

& 40 PAGES OF

**SHOPPING
EXPRESS**

BARGAINS !!!

AMAZING ATOM CHIP ANNOUNCED

Why Hitachi's breakthrough will transform computing forever...full details on page 7



PRIVATE EYE

Just how good is the monitor you can wear?



THE DIGITAL WAR

How combat computers are being used in the Gulf War

LOOKING FOR CHEAP PC DTP?

EXPRESS REVIEWS THE £100 AVAGIO PACKAGE



frontend

edited by Colin Campbell

VIRUS BLOCKS EXOCET MISSILES

French scientists have designed a computer virus which could stop aggressive nations using military hardware bought from that country, including deadly Exocet missiles. It emerged last week that

France - formerly Iraq's major Western arms supplier - had secreted 'Trojan horse' programs in missiles, fighter aircraft and radar equipment. The French can activate these by readiness at any time.

The viruses were inserted to prevent any country attempting to use French equipment against France or her allies. According to the Paris daily newspaper *L'Événement*, the viruses could be used to deactivate French Exocet missiles before they hit a target.

One military expert told the French newspaper: "Not only the French, but also the British, Americans and Russians have proposed dispositions to make sure their arms cannot be used against them. We have the means of countering any equipment we have sold."

The virus could be used to prematurely explode missiles, render radar installations useless and send aircraft out of control. However, this so-called 'computer warfare' is a new business - viruses could only have been planted in equipment sold during the last three years. ■



Twin Peaks game sinks



Take a dead girl on a beach, a whacky FBI man, drugs, sex, werbes, cherry pie and David Lynch. Mix them with lookings of hope, add a fair whiff of cash and what you've got is one hell of a computer game.

At least that's the theory LGX games publisher Hi-Tech Expressions came up with as it reluctantly sold the licence for TV soap *Twin Peaks*. However, after weeks of sweet talking, planning, and otherwise doing business with television people, the whole project was dropped.

It seems we are to be denied a *Twin Peaks* game because (a) the asking price was too high and (b) *Peaks* peaked too early. ■

Through the spying glass

Pilkington Glass has come up with what could be the perfect solution for those corporations worrying themselves silly over 'computer spies'.

The firm is to launch a special new glass which is totally 'computer spy proof'. According to various officials and authors, it has become easy to spy on other people's data by 'tuning into' the electromagnetic radiation emitted by a computer screen. Pilkington says companies should change their current windows for new spy proof glass, a process the firm admits is not inexpensive.

Already major corporations, including British Telecom, have been approached. A Pilkington spokesman offered: "We know there is a genuine concern about this and therefore there will be demand for the glass. Certain organisations will see a definite advantage in securing their buildings." ■



FRISCO COMPUTER FIRMS REBEL

San Francisco's business community has reacted furiously to new 'computer workers protection' laws which were passed in the city last month (*Express* 11.3).

Big companies are complaining that the total cost in installing equipment will exceed £30 million. New computers will have to be bought where necessary, but the bulk of the cost will be in paying for anti-glare screens, adjustable chairs

and better lighting facilities. VDU operators will also be allowed 15 minutes break from their terminals every two hours.

The laws were passed following complaints from computer operators that conditions were intolerable, and were causing them pain and discomfort. The business community had agreed to the legislation at first, but its benevolent enthusiasm has cooled considerably since seeing the bills. ■

Smart spreadsheet learns by experience

A PC spreadsheet has been launched which can 'learn' to forecast financial performance using Artificial Intelligence. Instead of relying on strict programmed rules *Braisel* can extract expertise automatically.

Developed by Connecticut based Land Technologies, *Braisel* relies on a neural network sub-system in the program. It can base its predictions on its own experience, in broadly the same fashion as a human. If it makes a mistake it will learn

from the lesson.

Land Technologies president Stanley Dainesoff enthused: "Braisel is the first neural network program to be embedded into a spreadsheet. It's a breakthrough because it can be used by any PC user - no knowledge of neural network technology is required."

Braisel is out this week in the States priced at \$249. A UK distribution deal is expected soon; meanwhile call 0101 203 562 7335 for more details. ■

CHEEKY SPY RETURNS LAPTOP

Remember that portable? You know the one. It was lifted from the back seat of a car a few weeks back, contained tons of military secrets, and had the Government writing itself.

It seems that the mysterious machine in question was none other than a Zenith 386 (interview) which would normally set you back about £300 on the dodgy second-hand portables market.

The brief had the good sense to send the machine back to recover officials, although he appears to know a thing or two about computers - an 'important message' was left on the hard disk. ■



GAMEBOY GETS SERIOUS

So, you thought the Nintendo Gameboy was just another handheld games machine. Not so...

US firm GameTek has launched the first business and productivity programs for Nintendo's wonder-gadget. Called the InfoGenesis series, the five programs will work on the 289 handheld without the aid of any peripherals.

They include a spelling checker which can correct spelling errors of over 70,000 words and comes with a calculator; there's Spanish/English and French/English translation programs; a travel guide providing information on hotels, restaurants and sights; and there's a personal organiser which enables the user to enter daily appointments via on-screen keyboards.

The programs cost \$39 each and will be available by September. No UK plans have been announced although Nintendo is likely to press for launches around the world. ■



Computer wipe out

UK peripherals manufacturer Chestoh has launched an interactive control unit based on the common skateboard.

Arisekate is a base unit on which you can place your own skateboard or Chestoh's own model. By moving around on the board you can control up to six different games, due to be launched later this year.

French software house Titus is working on skateboard simulators, ski run games and even street-wipe-ups which will work with Arisekate. The base and Chestoh's own skateboard will work with the Nintendo, Sega, C64, ST, Amiga and PC. Price has yet to be fixed. Arisekate should be out by the summer. ■

Programming kid is African king

A teenage computer programmer who has built a million pound software business has been crowned king of a huge tribe living in Ghana.

David Bolton, 17, who owns Surrey based software house Associated Computer Entertainment, was born in Britain. But his African mother was tied in line to take over the Asante tribe.

Bolton was crowned late last year, and now becomes Nana Aninku Ryemansa VI. But he says he is better at sorting out people's computer problems

than running a tribe, and relatives in Africa will take care of kingly duties.

ACE specialises in writing software programs which will solve specific problems for companies. Since leaving school Bolton has been making a fortune with his low-cost, but intricate programming expertise.

After the three-day crowning ceremony in Africa Bolton decided to open an African subsidiary of ACE. The company has already won a contract to computerise Ghana's ageing income tax system. ■



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Games Week

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• Modems make some changes

Interactive pop

People are forever whinging about pop records. If they don't like it and it's not theirs they're whinging about the repetitive beat. Soon, they'll be able to make some desired changes of their own.

Warner Brothers was showing off a new kind of music CD which will allow you to change aspects of a song you don't like. The CD has three channels, one of which is like an open MIDI channel, which allows you to get inside the song and mess around.

If a CDTV compatible and is being described by Warner as being "one step beyond sequencing", there are no problems with copyright either.

Only in America

In the thoroughly bad taste stakes there were two companies making impressive runs. Both had hit upon the idea of launching games based on - you guessed it - the Gulf Conflict.

The first, from Bushy Games appears to be a strategy game which soon degenerates into a run of the mill beat-'em-up. It's called Saddam. If arcade violence is your bag then there's always Attack Iraq from Megawatt. Thankfully, neither are coming to the UK.



• Tramiel: Lynx changes

Fighting spirit

Sam Tramiel, Atari's ebullient boss, was in pugilistic form at CES. Announcing a savage price cut for the Lynx (down to \$199) he boomed: "We will not abandon the video game industry this company founded. We're going to win back the American video game playing public from offshore competitors. We'll do it with features no-one else offers - full colour, full graphics and multi-player action."

AMERICA: WHATEVER

Everything from the innovative to the plain crazy was shown at last week's Consumer Electronics Show in Las Vegas. Express turned up to view the impressive as well as the baffling...

American computer entertainment has gone soft in the heat. The Winter Consumer Electronics Show in dizzy Las Vegas proved that the whole show is finally, undeniably, comfortably, stark-raving bonkers. There were assembled such a gaggle of gadgets, mad peripherals and loopy software that, for the innocent, it must have seemed like a bleeping, luminous asylum. And it was.

Anyone who asks the timeless question, "whatever will they think of next?" would have found some satisfaction in these vast halls.

For those of us with more than a passing interest in interactive entertainment, emerging media and neat devices, here were a few answers and a lot of questions.

Real computers such as the PC and Amiga have retired to darker corners, but their lack of profile has done nothing to dim the remarkable software coming from the west coast of America.

One title to dampen console mania was offered by a company called Interplay. Castles is called as a cross between Populous, Sim City and Railroad Tycoon (all of which are marvellous pieces of software). You get to set up a castle in dangerous Medieval times, develop surrounding dwellings, establish communications with necessary outposts and then defend the bit from marauders. It takes strategic skill, financial acumen and more than a jot of common sense. We reckon on Castles

making an appearance here in the autumn.

CDTV TIMES

Unfortunately for the PC and Amiga, entertainment based computers (as far as entertainment goals) are regarded as being terribly 1980s in American entertainment based computer shows. They last after hand-bells and salivate uncontrollably at the mere mention of the words Compact Disc. This is why Commodore has found itself in the unfamiliar position of being well regarded.

These were a sorry few days of spring for CDTV, which has spent the past few months shivering from the cold and calculating scrutiny of a cynical industry. Just when it seemed like CDTV was heading for port in the future and how well it works.

Even better for the boys from company C was the dismal showing from rival Philips. If CDTV was there it spent the whole four days hiding in the toilets.

This time last year people were carefully predicting that Commodore "just might" pull off a surprise victory in the Woking versus West front against the Dutch Masters. Now Philips, not so long ago the feisty standard bearer of interactive home entertainment, seems like a tall and bleated has-been.

Judging by CES, Commodore and CDTV are in the ascendant,

but fortunes change over so quickly and Commodore's honeymoon could come to a sharp end if Philips does manage to flesh the job.

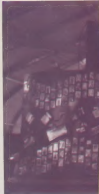
For now, though, the Americans are ultra enthusiastic about CDTV, and who can blame them? The latest interesting CDTV on display were bright and colourful arcade games which your average ST or Amiga owner would go gaga over. Then there were interactive encyclopaedias and atlases (stop yawning, these are a good deal more fun than they sound), and even a Maybridge "Women in Motion" CD from UK publisher CRL. This is basically a load of animations taken from stills shot in the last century by the guy who proved that a horse does leave the ground when it's galloping.

Instead of horses you get naked women, but thankfully, CRL has refrained from treating us to interactive pornography. OK, so we don't know what the point is, but at least publishers are being given a carte blanche to come up with interesting ideas, be they good, bad or just plain weird.

Commodore is far too liberal to be a Nintendo and for that reason CDTV is as frail as it is fascinating.

NINTENDO GO-GO

Apart from being the event where consumer electronics firms show off, CES is also the place where Nintendo shows just who is boss.



• Castro steps: Nintendo is still the boss.

In the same week that Nintendo announced more monstrous sales figures it imperiously took centre stage once again. Nintendo bosses must have noticed though, that console and handheld prodigies such as Sega, NEC and Atari were happily doing business, attracting punters and otherwise growing in confidence.

Last year Sega's stand was completely eclipsed by Nintendo's. This year it was just even-shaded.

America is definitely still mesmerised by Nintendo, never more so than with the Game Boy. Here were dozens of games from countries around the world. Ocean came up with

What's on Lynx

Some have complained that the Lynx software library is too limited. Atari last week counted 15 games that are ready and waiting. They are: Rampage, Roadblasters, Zaxxon Mercenary, Pygar, Mr Pac-Man, Tropic's Adventures, RoboSquash, Blue Lightning, Chip's Challenge, Electrotop, Gates of Zendoron, Guntest, Knux, Stone World, California Games.



• CDTV: a happy event

EVER NEXT?



the best of British games with a few Game Boy offerings including Roboco.

If the software wasn't good enough there were always the crazy peripherals. Try the Light Boy which is a lighted magnifying glass which can be fixed to the front of your Game Boy screen. It enlarges the image and brightens it, so you can play in those literally inaccessible dark places.

And Magoplay is a jukebox for the Nintendo Entertainment System. All you do is stick all your cartridges in the box, and choose your game by pressing the right buttons. It looks impossibly expensive but its price has been fixed as yet.

• The Jawless Action Chair isn't ready yet, but when it arrives expect to hear a lot about it. The seat acts as a joystick - the player creates game action by using body motion to activate electronics in the chair base. Five buttons are located in the handle grips. The Action Chair will be launched for the Magadevire and NES later this year.



ATARI SHRINKS

Atari knows better than to show an ST in a place such as this, in America it's a cheap and not particularly impressive Macintosh alternative.

At CES the firm was showing off its snarley redesigned Lynx line news and, a little implausibly, was attempting to lull the Portfolio on an alien world public. However, it was behind closed doors that the best of Atari showed itself.

There, a dozen software publishers good and true assembled to get the low down on forthcoming product. The subject which apparently attracted the most discussion was the super-console codenamed Panther.

Only last week Atari was hinting that the games playing world might get a peep at the new beast. Then, at the show, Atari suddenly shut up shop and denied that anything called the Panther had ever existed. Atari sometimes has these fits of pomposity and self-importance, but who can deny this admirable company a few indulgences?

Trusted games publishers have been warned not to blab any Panther details to press or public. The official line is that Atari is "an innovative company" which isn't wont to give its secrets away. Express will bring you all the Panther details just as soon as someone else gets Atari's secrets away. ■

NEC in the fray



NEC's TurboExpress was launched officially and takes its place as the fourth hand-held games machine from a major company. It can run any of the 50 TurboGrafx games currently available, boasts 512 colours and costs \$250. NEC has yet to decide whether or not to launch in the UK. ■

Sega sums up



• Game Gear: colour in demand

Sega has been doing its sums. While the colour hand-held Game Gear was being launched, the company came up with a few interesting figures for all you data fiends.

According to market research undertaken in the States:

- 33 per cent of Game Boy owners will consider trading up to a colour hand-held.
- 30 per cent of first time buyers say they are prepared to pay more for a colour machine.
- 1,400,000 people will buy a colour hand-held in America this year. ■



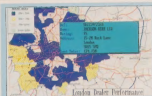
• Gamebiki get the whole family involved.

Fun for four

Nintendo has a vision. It sees the whole family sprawled across the living room playing the same Game Boy game at the same time. The firm says this is a "new version of family board game entertainment".

Nintendo reckons 24 per cent of Game Boy owners in the US are over the age of 18 and that 87 per cent of all owners want games that appeal to adults and youngsters. With this in mind a four player adaptor has been launched (officially called Gamebiki).

It costs \$29.95 but, for the moment only works with one game: F1 Race, which is bundled with the adaptor. ■



• Autoroute: Continental style.

Autoroute upgrade

A new "Windows style" version of the hugely successful Autoroute Plus software has been launched by HectClass. Version 4 comes with a pan-European full-screen map with improved curved roads.

Along with the large European maps, there are two more detailed screens showing France and Great Britain. The useful 'routing' module which allows the user to set up the price of a journey has also been incorporated into the main body of the program.

On top of this, the Gaoetter module now allows users to add and then manipulate new sites, symbols and even opening hours which can be used to warn users if bridges, tunnels or roads are closed. PCX formatted pictures can also be added, and will pop-up on screen as well as printing out. Printer support has also been ramped-up with more printers being supported.

Price for the PC version is £245 for the English and French versions. If you wish to make use of the European system you will need to pay £245. For more information call 0704 450077. ■



• Hyatt dips one up.

Chips make man millions

The man who the US Patent office says invented the relationship 23 years ago is finally set to become a millionaire as he prepares to sue for royalties.

After nearly a quarter of a century Gilbert Hyatt, 52, last year convinced the US Patent Office that a prototype he developed in the front room of his Los Angeles home was indeed the granddaddy of all the microchips in the world today. Now he intends to use the money from royalties to help fund developments he is currently working on.

The Patent Office ruling means that Hyatt can claim millions of dollars from all the computer companies which use his idea and he intends to sue any that refuse to reimburse him.

But he insists that the money won't change his life, and that he'll continue to live in his modest home and drive an ancient - but reliable - Toyota. ■

Forgers foiled

A computer system which will prove passports and other ID documents from being forged has been patented.

American inventor Peter Tai has based his system on a computer and a camera. By creating a mathematical equation of a person's face the system reduces it to a set of ratios which can then be checked in a matter of seconds. ■

ATOMS ARE KING OF THE FUTURE TECHNIQUE

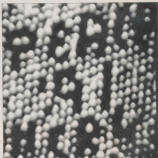
By Stuart Anderson

In an experiment which could have wide-ranging implications for computing, Hitachi has succeeded in manipulating individual atoms to write a message.

In an appropriate gesture for the times, scientists at the Hitachi Central Research Laboratory (HCL) write "HCL" "HCL" by removing sulphur atoms from the surface of a crystal of molybdenum disulphide.

The technology used to write the message could be used to create laser microscopes that ever thought possible which would run at extraordinary speeds. Alternatively individual atoms could be used to store data in an extremely compact memory device.

The device used for manipulating the individual atoms was a scanning tunnelling electron microscope. This machine suspends a metal probe just 0.00000001m (10 Angstroms) away from the surface of the crystal; the probe has such a fine tip it is only a single atom wide at the end. The probe is



• The world's smallest message, written in atoms of sulphur.

moved using piezo-electric crystals like those in electronic lighters. In a lighter, pressure on the crystal produces a voltage which makes a spark - the reverse is done in the tunnelling electron microscope; a voltage is applied to the crystal which then expands fractionally. Using this remarkable device, Hitachi

scientists applied a voltage to the probe which "evaporated" the individual atoms in the crystal.

The technology differs radically from that used by IBM when it created its more corporate "IBM" message last year. The IBM message was formed by firing xenon atoms at a surface cooled to near absolute zero so

Learning with an Amiga

Educational software house LCL has released what it reckons is the first Amiga program aimed at teaching children how to read and write.

Aimed at three to eight year olds, Reading Writing Course comprises 24 programs, two books and an audio tape for LCL. With music and colourful graphics it covers attainment targets for the National Curriculum including the alphabet (both lower case and capitals), spelling and word recognition.

The program also contains programs to encourage children to write their own stories and poems as well as reading books.

The course can be easily adapted for use in the classroom and is also suitable for dyslexics.

LCL can be contacted on 0491 579345. ■

Spot an Oric

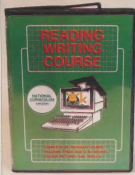
Oric users desperate to swap tips and anecdotes will like minded people will be interested to learn of the second Oric Star Monthly meeting on February 28.

It's to be held at Rhett's Sports Club in Aylesbury. Books, from 10am until the early evening. Organizer Dave Dick promises loads of demos as well as a chance to look Oric's to more mainstream micros.

"We had about 30 people last year, but they came from all over the place. We're even expecting a few members from France."

Dick said it was all very friendly and suggests drinks at the bar after the meeting. ■

• If you have an Oric or another ancient computer why not drop us a line to Outpost: Machines in the sand edition. Enslave a photo and you could win £20.



• Read and write with your Amiga.

epi nearer to reality

KEY TO TECHNOLOGY

they did not fly off again. Hitachi's technique operates by removing atoms, and works at room temperatures.

Hitachi believes that this atom removal technique is much more applicable to creating atomic scale computing devices as it is analogous to the current etching techniques and is inherently more controllable. Using this technology Hitachi hopes to be able to build processor chips many times smaller than at present. Size is important, as the limiting factor in computing speed is increasingly becoming the time it takes for an electron to move around the circuits; clearly the smaller the device the less time it takes for the electrons to move around it.

Computing at this scale opens up huge possibilities, but also huge complications as well. For example, when the wires down which electrons flow are so narrow, the electrons start to exhibit quantum mechanical effects; for example they stop behaving as particles and start acting like waves.

You can no longer think in terms of voltages and currents, but instead of refractions and interference. A whole new way

of designing chips will be needed.

Atom scale processors are still a distant dream, however. A more immediate application of this technology is as a memory storage device. At present data is stored as magnetic orientation of crystals in a disk, or as pits on an optical disk. In theory data could be stored atomically on a crystal - an atom indicating a 1, the absence of an atom indicating zero. Even with built-in redundancy and huge amounts of error checking it would still be possible to build a compact storage device with many hundreds of times the capacity of existing technologies.

The announcement of the ability to move individual atoms was made last week at Hitachi Technology '91, an exhibition of the Japanese giant's current research and development effort.

● In next week's Express we will be looking at some of the other developments Hitachi plans for the next century, including a superconducting microprocessor, levitating cars and high-definition television.

Brain drain game



• The Brain: sliced loaf.

Some people like to spend their spare time pottering about the garden. Others enjoy cooking up some nice food. But there are a select few who love nothing more than the chance to run some sharp instruments into a big fat juicy brain.

That's why Mindscape has decided to release *Life and Death II - the Brain*. The plot is simple enough: you are a brain surgeon who is presented with someone's dodgy grey matter. It's your job to make it better by slicing and cutting offending bits away.

This is of course interactive entertainment at its very best. Gamers may remember the original *Life and Death* which gave us all the chance to reach for the scalpel (not to mention the sick bag). Budding neurosurgeons and frustrated psychiatrists will be pleased to learn that *Brain* is out now on the PC for £29.99. ■



• Gods: hot as missiles.

Dancing with the gods

You may not be familiar with the pop group Nation 12, but pretty soon you'll be hearing their music. If not only in the charts then on the latest game from the Bitmap Brothers.

Gods, due in March from Renegade, follows in the tradition of previous Bitmap Brothers games *Xenon 2* which used a tune by Boom the Bass on its soundtrack.

A horizontally scrolling arcade adventure based on the story of the seven tasks of Hercules from Greek mythology, Gods will feature

a track from Nation 12 called into the Wonderful. Nation 12 comprises ex-U2/Yes man John Fox, Simon Rodgers (of the Fall) and DJ Stevens Ahead. The track will be released through Rhythm King Records, co-founder of Renegade with the Bitmap Brothers. Later this year.

So if you and Amiga owners will be able to get on down while battling monsters for £24.99, while PC users can look forward to getting funky with the supreme being for £29.99. ■

Computer stops the traffic

Computer-based toll booths could be installed in British cities to combat horrendous traffic problems.

Worcester local council says that it will be first city to install booths, and it is waiting for the technology to be completed. The city has to cope with over 40,000 cars a day just as soon as the technology is completed.

Instead of the old fashioned toll booths motorists will have to buy special cards containing microchips to put in their wind screens. The cards will work like photocards, with being wiped from them as the car passes special sensors at the sides of the roads.

Any cars not displaying a card will have their registration numbers automatically photographed. The owners will then be sent a quarterly bill.

Research on the system is still being perfected in universities in Europe and America, and the council want to make sure that it will work 100 per cent before commencing itself. ■

For more of this week's computing news turn to **Whole Wired World** on page 39



• Green: going cheap.

Cheap laser

If you're looking for a great printer at a reasonable price, check out Crown Computer Products.

The Lancashire based dealer is selling Ricoh laser printers for £999. Lasers usually start around the £1,500 mark.

This Hewlett Packard LaserJet II compatible features 1.5MB of memory and can muster a 300 x 300 dots per inch resolution. It has an average life of 800,000 pages. Call 0754 895815. ■

Leo lined up

Enterprise has launched a 386ix laptop for power hungry business types on the move.

The Leo Sport costs £1,999 and features 2MB of RAM, a rippy 16MHz processor and a very useful 40MB hard disk. Display is basic 16 grey scales and battery life is four hours.

Interfaces include one serial port, one parallel port as well as ports for an external full keyboard and extra floppy disk drive.

LeoSport measures 12.8 inches by 12.3 inches by 2.3 inches and it weighs a mere 10.9 pounds. For more information call 0256 463754. ■



• Leo Sport: 386 on the move

Mighty mice device

A new range of "ergonomically designed" three-button mice has been launched by Logitech.

The MouseMan series of input devices comes in both conventional and cordless forms which are both compatible with IBM PC, PS/1 and PS/2 computers.

The cordless version works via low range radio transmissions enabling the user to be out of visual contact with the computer.

Both the corded and cordless versions come in right and left-handed forms. They are compatible with Windows and Microsoft mice routines. The mice are available in serial, mouseport, and bus configurations for the right hander. Left handed users lose the bet version.

Along with the hardware comes

MouseWare software. This includes LogiMaze, the pop-up control panel, Mouse 2-3, and a new version of Clicker, a utility which enables users to create their own mouse macros.

Mouseman corded costs £95, the cordless version retails at £125. For more information call 061-480 9611.

Not content with mice, Logitech has also produced a new trackball device for the Macintosh. Called Trackman, this latest Logitech pointing tool has three buttons and comes with what the manufacturers call "hand conforming shape". It interfaces via the ADB bus, is X-Window, Macintosh and A/UX compatible. Trackman costs £149 and is only currently available in the United States. ■

■ Mouseware hands on.



Computer thief's sentence halved

A man who was jailed for two years for handling thousands of pounds worth of stolen computer hardware has had half of his sentence suspended. Stuart Thompson, a businessman from Chesham, was one year of a possible prison term suspended because he co-operated with the authorities.

Information given to the police by Thompson led to the arrest and successful prosecution of two other people; the burglars themselves.

The thefts occurred between April 1988 and July 1989 during which time over £130,000 worth of hardware was stolen from colleges and universities throughout the London area.

Thompson claims that he thought something was amiss when he was asked to handle a computer worth nearly £40,000. It later transpired that the machine had been taken from Imperial College in Kensington, London, and had contained a great deal of sensitive information.

The information was later recovered after Thompson handed the computer to the police (which also helped towards reducing his sentence).

Aside from the Imperial College robbery, computers were also taken from King's College - where many sensitive scientific experiments take place - and the London School of Economics. Hardware from both of these robberies was also handled by Thompson. ■

On-line service finally switched off MICROLINK SCRAPPED

Veteran on-line service Microlink is to be closed down after a lean three year spell during which subscribers dwindled from over 12,000 to less than 4,000.

Loyal subscribers are being offered free membership to rival service CompuServe. The Microlink network, which was originally set up to imagine publisher Database, featured access to a number of databases but was mostly used

for information relating to computers specifically.

Database had transferred the service from the care of Telecom Gold to AT&T hotel two years ago. However, the transition was not comfortable. Sources suggest that of the 4,000 members online before the transfer, only 3,000 followed the service across.

A spokesman for AT&T hotel said that Microlink members would find much the same ser-

vice with CompuServe: "We looked hard for a service which would fit our original criteria," he said, "CompuServe filled that role."

Microlink subscribers will be informed of the change over the next few weeks. Meanwhile, other services are hoping to pick up ex-Microlinkers. The Direct Connection in London is offering free sign-ups plus two months free usage. To qualify call 081-853 3955. ■

BT hits PC user group

British Telecom has cracked down as the PC Independent User Group for distributing a public domain disk containing telephone codes.

Although the codes can be found in any telephone book, BT says they are copyright material which cannot be reproduced without permission. The PC Independent User Group claimed the program was not making anyone any money, but was still ordered to withdraw the PC disk.

The disk contained STD numbers (area codes) and was a basic piece of software. It is possible to subscribe to a PC based phone book through official third party licensors, although these can cost up to £100 a year.

A PC Independent insider told Express: "We'd had the disk on our books for a long time, but BT suddenly got very annoyed about it, so we had to withdraw the disk." ■

Dynabook slims



■ Dynabook: cut down.

Good news for PC owners looking for a portable computer which doesn't require you to pump iron first. The ultra-slim, ultra-small and previously rather expensive range of Dynabook laptop computers has gained a new addition and is celebrating with a price cut of nearly 50 per cent.

Dynabook Technologies Europe launched the machines, which weigh in at an amazing 5.3 pounds and yet pack a 16MHz punch, last year to some critical acclaim. The recently announced 45 per cent price cut brings the cost of the 250k and 400k versions down to £1,795 and £1,995 respectively. The new member of the family is a 110MHz hard disk version priced at £3,295.

Also launched are several add-ons such as a 5.25-inch drive, an ATX keyboard, and an MS-DOS compatible mouse. Call 0628-473383. ■

Olivetti compact printers

Olivetti has launched two compact printers aimed at the home and small business user.

The 9-pin DM009 and 24-pin DM124 are IBM PC compatible, offering three print speeds and a wide variety of fonts. A colour version, the DM124, offering full seven colour printing, is also available.

The 9-pin machine prints at 36 characters per second (cpi) at its highest quality while the 24-pin printer will turn out sharp letter quality material at 60 cpi. Both print at speeds of 250 cps.

Prices for the range are £209 for the DM009, £299 for the DM124 and £319 for the colour DM124C. ■



■ New prints Olivetti's latest.

Atari redesigns games machine

LYNX II
ARRIVES

• The new Lynx: smarter, smaller and cheaper.

As first predicted in *Express* (Issue 37) Atari has launched a 'shrinker' version of its Lynx hand-held games machine.

The announcement coincides with drastic price cuts for the machine in the US. Some \$50 was sliced off the machine, and Atari UK is expected to follow suit later this year with a straight £99 pricepoint. Lynx currently costs £120 in the UK.

The new Lynx is slightly more

compact and easier to hold, although it is still not as small as either the Sega Game Gear or Nintendo Game Boy.

Atari says it has redesigned the machine to make it 'easier to carry around'. A spokesman offered: 'It's a natural trend to reduce the component count and make a product smaller.' Graphics chips and the like have been 'glued together' in order to make the case smaller. The new case is a good deal more stylish

than the original, which had been criticised for being ugly and unwieldy.

Atari boss Sam Tramiel claimed that the price cut had been brought in because of cheaper manufacturing process, although a more likely explanation is Nintendo's huge success with the cheaper, but technically inferior Game Boy.

In addition to cosmetic and

ergonomic changes, new developments have lowered the manufacturing cost for the new system. 'These savings are being passed on to the consumer.'

Tramiel also promised to double the amount of games for the Lynx (currently 145). Titles in the offing are *World Class Soccer*, *Checkered Flag*, *Shanghai* and *Tournament Cyberball 2072*.

Sony
changes
its tune

Sony aims to muscle in on Disney and Universal territory with a proposed series of 'Soyland' theme parks.

The Japanese giant has given its Columbia Pictures wing the go-ahead to start work on developing the high-tech amusement parks. Information about when and where the first park will be opened will not be revealed until the end of this year although Southern California is 'upend'.

'We anticipate multiple locations, but none have been identified. The outlook has not been limited to southern California, but it is clearly being considered,' said a spokesman from Columbia.

The parks are likely to be based on a futuristic world with plenty of amazing gadgets to keep visitors jaws dropping. ■

Packed with
programs

Micro Haze Limited has released a mega CD-ROM disk so packed with programs that the file list alone takes up more than 1Mb.

Based on the Valentis bulletin board, the disk comprises 10,000 files for just £65. Micro Haze claims that all the files are unique with no duplicates or similar versions of the same program.

A specially prepared demo of Quantech's speech package SoftSpeak introduces users to the disk and its contents. Software includes everything you need to set up your own DBS and other UK databases available elsewhere. You also get free access to Valentis DBS.

Micro Haze, which also sells CD-ROM hardware, can be contacted on 0452 371707. ■

Computer chess champ censored



• Chess champion banned by humans.

A new term might be creeping into the language, along with *against*, *resist* and *racist* we can now add *computer*.

Computers, especially net-connected ones, are still not being accepted in many spheres of life, certainly not within the staid world

of provincial club chess.

Recent world champion and holder of the Personal Computer title Chess title in Lyon, France, Chess Champion 2175R has been banned from appearing at a local chess event.

Organisers of the Killington

Chess Congress, a two day club chess event held from February 2 and 3, decided that 'some entrants might be unhappy if others were when they were competing were down against the computer and were able to score an easy win'.

Chess Champion is rated at 170/175 which places it mere in the league of the Grand Master than village strong. The reason for the Killington Committee's refusal is probably better summed up in this extract from a letter sent by club member Tony Williams to programmer Chris Whittington: 'Typically we don't, at present, have to be innovative and take risks in trying new ideas'.

Normal practice at tournaments such as this is for the programmers to announce to players that a computer or piece of software has been entered. All prize money is declared by the microchip. Keypunchers, and human players are given the option not to play. This has not happened in Killington. ■

Telephone
look-in

Videophones enabling people to see and hear callers may be on sale for less than £100 in the future.

A team of scientists at Edinburgh University have built an electronic video camera with a plastic lens, sensor and processing circuits. The tiny camera uses common chip technology and could be up to 100 times cheaper to produce than current cameras.

'The cost of the camera is steadily the most important thing preventing the development of new vision and sensor products,' Professor Denyer, the team leader, said. 'With the new technology we expect to be able to build a camera for £20 to £30 pounds.' ■

Citizen sees the light

A tiny disk drive weighing just 168 grammes has just been launched by Citizen Europe.

The diminutive V Series drive is aimed at notebook, portable and laptop computers. The first of the series is a 1.1 or 2MB, 3.5-inch drive. Using EPP/PPM (electrically - wearable - programmable - read-only memory) the drive also makes use of a side mounted ferrite head, aluminium plate frame and control

circuit board. It measures 15mm high, 95mm wide and 120mm deep.

The drive is not aimed at the end-user and is only intended to be sold in large numbers to developers. However, Citizen says its developers will help make laptops and portables ever smaller and lighter. ■

• Citizen light drive: the laptop shriller

Cheapest
286?

Digital Matrix has launched what the firm claims is the cheapest 286 PC on the market.

The AT7 retails at a very tempting £381 - £M reduces the very other computer which comes close in the price stakes is CAS's 44M 286. In comparison Digital's popular 286 retails at £519, while America's dual drive model costs £799.

DM's basic system features a single 3.5-inch floppy drive, 1MB RAM, serial and parallel ports, a 14-inch white screen monitor. Hard drives are also available. Call 021-722 3023. ■

THE WEEK IN VIEW

Computer viruses have the potential to break down enemy military communications, says the US Department of Defence. Edward Widing, editor of Virus Bulletin, explores the possibilities for new warfare tactics.

In February 1990 the US Department of Defence issued Program Solicitation 90.2 Project A90-217. The project, for 'exploratory development' was a feasibility study to determine: 'The potential for using computer viruses as an ECM (electronic counter measure) technique against generic military communications systems.'"

The research project stressed that efforts should be focused on radio frequency atmospheric signal transmission such as that performed in tactical military communications. The theory that CVM (computer virus countermeasures) might replace traditional ECM methods (jamming and spoofing) has been propounded in the United States, notably in an article in Defence Electronics which appeared in October 1989. The attraction lies in the fact that self replicating code transmitted by radio wave, once embedded in a processing centre, can be programmed to perform any number of subversive operations (from scrambling enemy data transmissions, to redirecting or blocking them). Thus there is more control via this method than merely suppressing enemy communications. Moreover, self-replicating code continues to attack and disrupt more than just one target - CVM can initially attack the weakest element in an enemy communication network and gain subsequent access to the intended targets. The theory of CVM depends on two impossibilities: is it possible to transmit virus code directly to a hostile receiver? Will the enemy be operating with a machine code unintelligible to the virus? At the moment such theo-

ries can be placed firmly in the sphere of science fiction.

No official studies on the military use of self-replicating code (virus and worms) have been made public, although most observers are certain that studies are being conducted in both the US and Europe. Implanting virus code and Trojan horses (programs which perform functions beyond their specifications) into software intended to be used on enemy processing equipment is a highly feasible tactic. For this reason, highly sensitive software supplied to Western intelligence and military units is usually supplied as source code and is vetted (line-by-line) before being compiled in host.

The idea of implanting destructive or information divulging code (particularly that which exploits covert channels on computer processors and which is nearly impossible to secure against) into communications or weapons systems intended for sale to a prospective enemy is also feasible, although no incidents of this have been publicised. This is analogous to the classic guerilla warfare tactic of supplying the enemy with exploding bullets and bugged radio transmitters.

The feasibility of CVM increases with the trend towards communications, standardisation, software standardisation, standardisation message formats, distributed processing and networking in many armed forces. However the only computer viruses likely to be causing troops of either side in the Gulf any inconvenience in the coming months will inevitably attack the faithful old PC. The latest prank from Israel is just such a virus, appropriately named Sadotest. ■

Hey! Get in touch with us! Express is always on the look out for news leads and tips-offs - and we'll pay you for passing them on too!

Also, if you have any burning ideas for features or surveys then drop us a line - remember, we cover every aspect of computing.

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COMING NEXT THURSDAY

Future formats

What storage devices will replace today's magnetic media? - would you believe holographic EPROMs?

Smashing grabs

G2's amazing new 24-bit frame grabber for the Amiga put to the test.

Tomorrow's whirl

Hitachi's plans for superconducting computers and flying cars!

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■ Out of order

Imagine my excitement when I opened Express 110 to find that the letter I had sent you a couple of weeks earlier had been published. Thrill of thrills. I was so jubilant at the prospect of receiving £2 early in the New Year that I immediately drank it several times over. Imagine, then, my further excitement when you published my reply to your response in my original letter in Express 112. Another five!

But... as yet... still no fivers have materialised. Imagine then, the horror of seeing a new symbol appear in this week's Express indicating that only two of the letters featured on the page had actually been awarded a 'Haydn Five'. Couple this with the fact that your sister publication Amiga Format has admitted that they don't really give away a binder and T-shirt to every letter that 'escapes the original treatment', but only to those identified as a prize letter and 'tip off' springs to mind.

I realise, of course, that the head of your letters page does not claim to pay a fiver for every letter published. It only offers it (sic). Technically, if you say I was not awarded a fiver, I can do little about it.

What I have done is cancel my subscription to Amiga Format. If I do not shortly receive my fivers from you, I will also cease buying New Computer Express and will, instead, browse through the bits I'm interested in in my local newspaper.

That way, I will still get the benefits of what you write without Future Publishing getting anything in the way of cash in return. Just as Future Publishing get the benefit of my (and other people's) letters to help them fill the magazine without the writers of those letters getting anything in return.

Kevin Patten-Smith, Scarsdale, Norfolk

Well, you're a bit of a plonker, aren't you Kevin, despite the impressive double-barrelled name?



EXPRESS MAIL

With your best
Haydn—the man
with the fivers to
give away

Write and tell HF-W what you think about anything under the Sun! Reach him at: Express Mail, 30 Monmouth Street, Bath BA1 2BW. Sorry, no personal replies, even with an SAE, as we're too busy writing the magazine.

All you have to do is read the letters pages, including my replies, and 4 is plain as the sky above you but not every letter printed wins to sender a fiver. And the words 'the man with the fivers to give away' in the panel at the top of the page, to my mind, doesn't even come close to implying that there's a fiver for every letter printed.

That's why I always mention in my reply whether a correspondent has won any cash — I'd hardly go to the effort of mentioning prizes in my replies if every single letter printed won to sender a fiver, now would it?

The idea of the new logos is to draw attention to winners so readers can go straight to the more interesting or witty letters on the page.

Still... there's more to quack as folk as my old granny used to say: I just hope your granny makes good and sure to send you a fiver each time you write her a letter.

HF-W

■ Virtual Reality I

I read Glenn Proctor's letter in Express 114 with interest, and without going over the top, would like to express my agreement with the principle of what he was trying to say about Virtual Reality.

We already have a very real problem with youngsters hunting so as to play fruit machines and arcade games. I am genuinely worried about the possible outcome when these arcades are offering Virtual Reality adventures. It totally entices environments.

There is only one argument against the abuse of VR which has not already been used against arcade addiction, and that is cost. The businesses behind these ventures will tell us that the kids won't be able to afford it, get hooked on them — but we all know that is rubbish. Youngsters are already turning to crime and other sinister pursuits to fund their addiction to amusement arcades; all they need is to set their targets higher and they'll be paying £3 to £5 a go with the rest

of 'em in the VR arcades.

I'd be interested to know what other readers think — are my fears well-founded, or am I just getting paranoid over a few harmless games machines?

Jon Hinch, Upton, Merseyside

Not paranoid, far, just a little too concerned maybe? There is not a massive problem with arcade addiction — a problem, yes but one nowhere near as serious as underage smoking and drinking. I'm not convinced that the arrival of Virtual Reality arcade machines will up the ante significantly — but let's hear from the readers...

My next correspondent has another angle on VR, also prompted by Glenn's letter on the subject...

HF-W

■ Virtual Reality II

Some people seem to think that everyone will have CDTV. Can these same people envisage the public at large all sitting in

■ The history of computing according to beards and glasses...

I have become increasingly aware of a trend amongst programmers and general computer folk. Have you ever noticed how all the best programmers and hardware engineers (most famous or rich ones, at least) have beards and wear glasses?

Here are a few examples off the top of my head...

Clive Sinclair
Founder of Sinclair Research — and father of the Spectrum
Jey Miner

Father of the Amiga
Brian Kernighan
Creator of C and Unix
Dennis Ritchie
also helped to create Unix
Seymour Papert
Little-known originator of Logo
Jonathan Sachs
Created the original Lokes 1-2-3
Bjorne Strömberg

Developed C++
John Warlock
Founder of Adobe and programmed something famous but I can't remember what
Paul G Allen
Co-founder of Microsoft
Bill Gates
Author of Pascal, Module-2 and Oberon
Robert Goodwin
PCW journalist/programmer

And the honour list...
Jeff Minter
Writer of psychedelic games and founder of Limasoft. I'm not too sure if Jeff still has the beard, though. (Almost certainly — HF-W)
Bill Gates
Co-founder of Microsoft. He's got the glasses, but has probably stopped programming, so giving up the beard

Grace Hopper
Inventor of COBOL (and I think it's about time we all forgave her — it was a long time ago, after all). As females really should be encouraged more, I'll just accept the glasses.
Keith Parnith
Hero and veteran of Express. Very hard-bearded beard, though. (Well, just a moustache, really — HF-W)

I think this is all pretty conclusive then, don't you? And there must be a lot more people I can't remember. So I've got the specs and am badly growing my beard now. I can almost feel the tension of pure binary surging at my fingertips, opcodes whizzing around my head and that deep-down feeling of completion or possibly assembly in the depths of the stomach. I'll go now, and start work on Orase V... Simon Boucher, Ry, Cambridgehire



• Beards and glasses make you boring, a potential computer addict and invisible to women. Maybe? Well look at Sir Cee...

Now close them, Simon — and worth not one fiver but two! And if other readers can help HF the gaps in your list of bearded, I might be persuaded to part with further fivers. HF-W

Back to skool?

That Colin Campbell bike is a real prat. (Why not come straight out with it, and say what you mean?) - H F W

What does he think is so amazing about a dedicated arithmetic computer that can compute the ratio between the diameter and the radius of a circle to one thousand million decimal places in a matter of seconds?

My Spectrum can calculate it to infinite decimal places in less time than that, and so can I for that matter. The answer is 2.8 recurring.

And don't tell me it was a printing error - either that Campbell may never visit to school or my Speccy and I are on a par with Einstein! I may not have a 486 processor between my ears, but at least I know a circle when I see one! *Clive Moxley, Teyford, Reading*

Well spotted, Clive. Colin must have been asleep throughout his elementary maths classes at school - or dreaming of playing tennis forward in the English World Cup squad. Everyone but Colin knows that the real hard sum you need to



do with circles is calculating the ratio between its radius and circumference.

As you will see from the picture, appropriate remedial action has already been taken against Colin - by our esteemed publisher, no less...

HFW

their Virtual Reality chairs wearing a RoboCop-type helmet watching Virtual TV, mowing their Virtual lawns, playing a Virtual game of squash with their Virtual neighbour - or even Virtually preening the human race?

Imagine walking down to the Virtual shops - everyone you meet could look like Madonna or Richard Gere. Vnus writers would have a field day!

This is a frightening view of Virtual Reality's future, and a scenario on which a sci-fi writer could write a cracking novel. As with all novels, it is pure fiction and not to be taken seriously.

By the way - the *Tomorrow's World* demo was done on an Amiga 3000. *D W Smith, Eccles, Manchester*

Interesting perspective Mr S, but I disagree with you about novels. Was 1984 'pure fiction and not to be taken seriously'? Or *Gullap Archangel*? Or even *Animal Farm*? I think not...

HFW

Domain debate

With reference to the current debate on domains in the public domain, I think there are a couple of points which have been missed. The first is that the domain are not really meant for public consumption - they are meant for coders to communicate messages to one another and to say 'hey, look, what I've done - can you do better?'. Often, it's not what is on the screen that counts, it's the programming behind it. So for the public to criticise a demo is like reading another person's private letter and commenting on that!

The second point is that the demo should really be viewed as an art form, just like a painting in an art gallery. The medium is a PCU and the artist's materials a computer. Whether you like them or not then becomes a matter of taste. Personally, I wouldn't want to wander round the Tate Gallery all day, but some people do.

I wonder what Picasso, Rubens or Van Gogh would think of the art produced

by Red Sector, The Silents and Fraxion and so if they were around to see it? *Paul Cusack, NBS, Isle of Wight*

I'm not sure quite what you're getting at here, Paul. If the demos are not meant for public consumption, then why put them in the public domain? If they are so private, why not send them to their target audience in the mail?

And surely, for them to be viewed as an art form like a painting in an art gallery, then they must be put on public view - and thereby be free game for independent criticism...

Any critic coders out there care to contribute to the debate?

HFW

I wish I had...

I recently witnessed another amazing application for a home computer which I'd like to be able to use on my Amiga.

It was featured in a film called *The January Man*, starring Kevin Kline in the lead role as the hard-bitten-cynical-tough-but-durable-but-with-a-heart-of-gold homicide cop. So that a cliché or what? As usual, said homicide cop is given 24 hours to close his case or the chief is gone 'till his ass' or 'till his arm is off the force' or 'till his kid has had his hands up wearing his ass for a hat'.

The interesting bit comes when Kline enlists the help of some loser art student friend of his (they were probably in 'Nam together) who turns out to be a bit of a home computer hobbyist. He knocks up a program in a couple of hours which not only catalogues all the previous serial killings, but produces a three dimensional map of their locations in New York (to scale). For some unknown reason the killer is trying to murder people to produce a star pattern on the city. Kline fumbles where the last missing piece of the pattern is about to fall in place, screams off to the scene of the crime and kicks ass. Suspect is booked for murder! The Chief gets off Kline's case and Kline doesn't need to go in the men's room and punch lockers.

The point I'm trying to make is: where can I get hold of the program that produces a three dimensional map of a city and which, presumably, has a menu option on it somewhere that says 'enter the time and location of your murder'. And how did the bastard knock it up in two hours? *Nick Booth, London SE13*

Amazing, isn't it, how useful and friendly computers can be to the writer struggling for a plot device that can be used to get out of a tricky corner...

HFW

Right to back up

I totally agree that backing up software is a necessity, especially when some companies charge £10 for a replacement! I mean, if you bought a new house and the solicitor gave you the keys, telling you it's illegal to make spares but if you do lose them we can replace them for £10 - I am sure that you would rip down the shops and get a copy done for £1 (saving £9 and a lot of time).

For every commercial game I own, I have a 'private version' - the back up that I use. Yes I know that it is illegal, but I feel it is justified for the following reasons:

- a) some of these can be loaded on to my hard disk
- b) the 'codeword' has been removed so I can get straight into the game without having to log up word 24 para 3 page 114
- c) if something happens to the disk then I can quickly make a backup without any hassles
- d) the software companies don't lose out, as I bought the original.

I usually get a gratis copy of a game first; if the game is crap then the disk is formatted. On the other hand if it's a good then I will buy it. If companies release software as leg-rides as F4 then they deserve everything they get. In my mind this is the same as piracy.

In short if the game is worth playing it's worth buying. If it sucks leave it be and maybe they'll get the message. *The Dream Master, Havac*

MAIL SHORTS

Semantic debate

Your reply to Alan Gibson (*Express* 114) may have missed the real meaning of the phrase 'rich bastards'. It was not meant humorously, but was 'obscene' in the sense that it was pandering to the emotion that prevents enjoyment of earned goodies - envy, no less.

Pedestrianly, if you use 'low budget' the alternative is 'high budget'. As you have commented before, piracy you have commented before, piracy you have many classes, but envy and a desire to 'get back at' the organised commercial sharks with the appropriate available makes it happen. *David Gregory Mayne, Arragh*

Well, my dictionary defines 'obscene' as 'filthy, offensive to the senses or the sensibility, especially in a sexual sense', so I still think the word is being misused in the context of our Rich bastards' leap-pole.

But you're quite right, David - envy and greed are certainly responsible for a lot of the unpleasantness in this world, and we may have added such a message subliminally. Sorry.

HFW

Chess master

I enjoyed the Chess Kings article in *Express* 114. Regarding Fred Folkers' offer of free copies of Delta - where does one contact Fred? Has anyone written a good chess program in Fortran? *Alan Jarvis, Oxford, Devon*

The honest answer is that we can't help or answer question. Alan over to the chess lists amongst our readers - I'll post any helpful answers I get.

HFW

69 going on 70

I couldn't help having a good laugh at your reply to Oiler Reader in which you thank him for being the first of our older readers to drop me a line. Two whole years ago, you printed a letter from a then 67 year-old asking advice. 26-year-old reader (70th birthday 26-12-91). *St Lawrence, Jersey*

Hardly fair of you - me and my life weren't looking after the letters pages in those days... But one of our oldest readers? I think we should be told.

HFW

Getting in quick...

Cool! Just to tell the rest of you that I have a New Year to you all on *Express*? *Dan Chandler, Nottingham*

Er no. Not by a long chalk!

HFW

Over the last ten or twenty years, computer technology has become so integrated into weaponry and strategic planning for combat that wars could not now be fought without it.

This integration has speeded up over the preceding five years or so due to huge advances in the technology, so that the present Gulf conflict is already being dubbed 'The First Microchip War'. With this in mind, we decided to take a look at the sort of technology which the armed forces can call on, both at headquarters and on the front line...

BACK AT BASE

America in particular has vast computational resources at its army's disposal. In military headquarters at various locations across America, huge supercomputers – far faster than anything available in the civilian world – run endless battle simulations. Seen the film *WarGames*? Well, it's not all far from the truth. Some of the best computer programmes in the world work at top-of-the-line speed to perform the programs which, in the final analysis, will win or lose any war.

Some of the computers known to be used by the military include the latest Cray machines, although Cray can no longer claim to make the world's fastest civilian computers, runtimes have it that the company produces incredibly fast machines in total secrecy – machines which are only purchased by the American military. One estimate is that over 50 per cent of the computers made by Cray are purchased by the armed forces.

Another supercomputer used by western armies is the Touchstone, manufactured by Intel. This machine – which costs the equivalent of the entire military budget of some small countries – contains up to 2,000 Intel 860 processors, each of which is as powerful as a Cray 1. The Touchstone operates at over 130,000 MIPS (million floating point operations per second), is shipped with 128 gigabytes of RAM as standard and has over a terabyte (a million megabytes) of disk storage. Most of its uses are so classified that the military won't even confirm that they use the machine, but one known use is in the design of the so-called 'Smart Weapons' – combat missiles which communicate with each other during flight for the most effective 'hit' on the target.

TERRAIN MAPPING

Another major use of the supercomputers is 'terrain mapping'. This is the process of taking reconnaissance photographs and turning the data they contain into three-dimensional representations. These realistic views can then be used to create more realistic battle plans – and also to program terrain-following missiles. The graphics 'front-ends' on these GPGs (Geographical Information Systems) would put the best arcade games to shame.

COMPUTERS AT WAR

Both on the front line and back at base, the armed forces are using the latest technology in the Gulf. Express takes a closer look at the kind of hardware and software the Western forces have at their disposal.

PROVE IT!

The main programming language used by the military is ADA, although there are still FORTRAN programs in existence, controlling some of the older hardware. For the 'intelligent' missile systems, the Artificial Intelligence language Lisp is often used.



• *Perley's suggested PC's – available to the public, but also widely used by the military.*

There is a great deal of work going into the field of 'formal methods' – essentially, 'proving' that a program is correct. Because such complex programs are present in, say, a missile guidance system, it is actually impos-

sible to make sure that there are no errors (we all remember that television footage of a submarine-launched missile spiralling elegantly back into the sea or top of the sub because of a software failure). To try and prevent programming errors which could potentially be disastrous, mathematicians and computer scientists are working on ways to prove that programs are correct without having to run them. Look out for 'OBL' – a formal methods language – becoming more prominent in the next few years.

RADIO WAVES

Although not as sophisticated as the computer hardware way back behind the lines, front-line computer technology is still extremely powerful. If you imagine, for example, radio operators sitting, tapping away at Morse keys, forget 4. These days, a typical military radio will cost more than the soldier operating it will earn in his lifetime – and contain computer technology far in advance of what most people will ever see.

To avoid detection, radio signals are not transmitted on a fixed frequency. Instead, transmitter and receiver are 'synced', and a code key (which changes every day, or even every hour) is entered by the operator. The key is used to generate a pattern of different frequencies, so that the radio is only on one band for a second or two before switching to the next. This makes it effectively impossible for enemy agencies to monitor more than a fraction of any message.

Even assuming that a message were intercepted, the encoding techniques used are so complex that it

WARS OF THE FUTURE

Vast amounts of time and effort are expended on the collection of information to assist the field units.

- **AWACS** (airborne warning and control system) planes patrol, constantly monitoring the radio waves and scanning the area with radar, gathering information which is sent not only to ground-based command posts, but also to aircraft currently flying, giving them the most up-to-date information possible.

- **Tallies** can read camera powerful enough to scan car license plates (this was stolen years ago, but is now most definitely true).

- **Reconnaissance aircraft** have incredibly sophisticated camera units, with which they take detailed pictures of the landscape for later conversion into computer-based models of the terrain. These units contain both infra-red and high-powered conventional cameras, which can be locked on to a target. The plane's pilot selects the target through a viewfinder, and then the cameras tilt and reveal automatically to remain trained on the selected area, taking photographs as long as possible.
- **Spies** (now there's an outdated word!) behind the enemy's front line gather data

and transmit it back using high-powered radio bursts, hiding radio direction-finding units.

Because accurate information is so vital to an army's success, and because the vast volume of information being gathered needs to be analysed on computer, much work is now being done on how to sabotage the enemy's computer systems. One way to do this is to introduce viruses or Trojan horses into the systems. As discussed in *Connect* this week, the US government is already known to be working in this area. And it is

already being speculated that the French have introduced Trojans into the Exocet missile guidance system which means that it can never be used against French equipment; indeed, speculation is rife that the French could even take control of an enemy Exocet in flight and turn it back against its owners.

Although very few details are being released by governments – for obvious reasons – it is clear that more effort is going into 'anti-computer warfare'. For, as one leading military figure put it: 'At the end of the day, the side with the best intelligence will be the winners.'



• On the battlefield, ruggedised terminals such as the FPC 2000 are invaluable for keeping commanders updated with information.

would take even the fastest computer a lifetime to decode the messages. Although the American military use the OES (Data Encryption Standard) algorithm for non-classified transmissions, it is rumoured that the CIA can break the code – and if the CIA can do it, the thinking goes, so maybe the enemy can. So for classified messages, far more sophisticated methods are used – just printing the names of the methods in *Excerpt* could get the editor and the publisher locked up for life!

WEAPONS TECHNOLOGY

Weapons is the area where the advances in computer technology are the most impressive. Because a missile's size and weight are critical, much of the miniaturisation technology which is now being seen in commercial devices was pioneered by the military, in order to be able to fit more sophisticated computers into the same space in the projectile.

Whereas 20 years ago a missile was merely fired at a fixed trajectory with a set power – that trajectory and power being calculated by massive computers so that the missile would (hopefully) land on the designated target, nowadays missiles can guide themselves, looking on to targets and even distinguishing friendly from enemy vehicles.

A number of different methods are used for missile guidance. Some of these are:

- **Semi-active pulse radar.** These missiles require that the aircraft from which they are fired retains the enemy in its radar until the missile hits. Thus they are controlled from the plane – should the pilot lose radar contact with the enemy, the missile becomes useless.

- **Active radar.** Missiles with active radar guidance actually contain their own radar at the nose cone. The missiles are known as fire and forget, since once launched they home in automatically on a target. Most of these missiles use 'Doppler' radar, which uses a variation of the Doppler effect to ascertain the distance to the target.

- **First generation infra-red.** Now almost obsolete, first generation IR weapons can only home in on the engine of an aircraft, which means that they are easily fooled – simply by turning the plane so that the missile does not have a direct line of sight to the engine.

- **Second generation infra-red.** Far more sophisticated, second generation devices not only home in on the heat of the engine, but also on other byproducts of the aircraft, which have been heated by air friction. The lat-

est missiles have such sophisticated computers that they can recognise – by the infra-red 'signature' the make of aircraft, thus ensuring that they are aiming at the correct target.

- **Anti-radiation.** Missiles containing this technology home in on radar signals – thus targeting any vehicle or installation which is using its own radar. This technology is still fairly new, but there are already missiles which, when launched, will circle round until they detect a radar emission – thus foiling the technique of shutting down all radar equipment when directly under attack.

- **Terrain following.** Some missiles have 'maps' of the terrain built in to them. After being programmed with the target and launched, they can recognise the countryside over which they are flying via a mixture of radar and infrared imaging, and match this information with the maps which they contain, correcting course as necessary. Highly efficient, these missiles can fly extremely low over the ground, thus avoiding radar detection.



• Data input terminals such as the Trans 477 shown here are linked to communications equipment for ultra-secure data transmission in the field.

FRONT-LINE SUPPORT

Because wartime scenarios are now so complex, commanders in the field must have access to computers to plan their manoeuvres. But it's no use just shipping an Amiga PC into the battlefield; conditions are somewhat more rigorous than in the average office. So some companies have developed battle-ready compu-

ters and data entry devices for use in the front line. These are designed to cope with extremes of heat and cold, be waterproof – everything from sandstorms to tropical typhoons – and to avoid emitting any electromagnetic radiation (any emitted signals can be detected and read by the enemy; someone 50 feet away could read what is on your computer screen with the right radiation-detection equipment).

Husky is well known as a company which produces a range of extremely rugged portable computers which are available to the public as well as to the military. The Husky Hunter, for example, is an MS-DOS PC with a 3.5-inch disk drive capable of running all the standard software – and, of course, the extremely non-standard programs used by the military. It is designed to be as sturdy as possible, and costs a hefty £3,444.

As well as ruggedised PCs, some companies produce specific-purpose military computers, such as the Thompson CSF FPC 2000 which, according to the sales literature, is a 'data entry device for communications networks management, logistics processing and control, weapons systems command centres and electronic warfare command posts'.

THE BAD NEWS

Front line is vital. A computer going down at the wrong time could mean the difference between a battle lost and won. And yet the machines are not treated well – they are banged about, dropped, stood on, thrown and generally mistreated to such an extent that it's a miracle that they work at all. But the physical damage is only a minor worry compared to the damage that could occur during a nuclear attack.

Not, surprisingly, just the host. A computer could be well out of blast range and still be completely unusable, due to a phenomenon known as EMP – Electro-Magnetic Pulse. If a nuclear weapon should be dropped, a huge surge of electromagnetic radiation would effectively 'blow out' any electronic machinery within a huge radius. The problem being the designers of battlefield equipment is that it's extremely difficult to simulate this (without actually dropping a bomb), so no-one knows quite how much equipment would be affected, or whether it's possible to design electronics which would be immune.

But then, if a nuclear missile was launched, the last thing that most of us would be concerned about is whether the PC was working. ■

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USELESS COLOUR

British. Absolutely brilliant. My heartfelt congratulations go to Strata Inc, an American company based in St. George, Utah, which has already won the 1991 prize for the most pointless Macintosh development of the year.

The company has proudly announced that it is soon to be shipping a product called StrataVision Paint, which - for a mere \$695 - will offer users a palette of 261.5 million colours. This is, indeed, 64-bit colour - twice the 32-bit standard that Macs presently use.

According to the company's director of corporate communications, Ken Perkins, "The usefulness of the program is that in some cases, when you go to output a 24-bit colour image there might still be some banding. With 64-bit colour, instead of making a jump between colour gradations, there's more of a range in between."

The problem with all of this? Ken Perkins again: "This technical limitation right now is that there is no way to display it or output it."

Yep, that's right, ladies and gents. No monitor is capable of displaying that many colours, and no output device is capable of printing them. But apart from that, I can see that the program will have hundreds of uses.

If you're the sort of person who finds products like the above irresistible, you can get hold of Strata Inc by phone on 0101 801 628 5210, or by fax on 0101 801 628 9755.

GOING DOWNMARKET

Presumably the reason that you bought a Macintosh was that you wanted to get away from that horrid monstrosity that PC users call DOS. And you didn't want to be stuck with feeble imitations like those invented by Atari, Commodore

and the like. Or, even worse, Windows, which is a little like the Macintosh experience must appear if it's a typical user with a burning drive on the hand controlling the mouse.

No, this isn't going to degenerate into one of those MCBYDS/INC90 pieces with Hayden Fitzhugh leaping to match. What this is all leading up to is an announcement that Insignia Solutions has released a special version of SoftPC for the Macintosh Classic and LC.

Yes, having last week told you how to make your Macintosh look like a rather odd-coloured NeXT machine, this week we go to the other end of the market and look at how to persuade your Mac that it's a lowly IBM PC compatible machine.

SoftPC has been around for some time, but the new version just announced has been specially tailored for the Classic and LC - it won't work on Macs other than the Classic, LC, SE and Portable - and has a price somewhat lower than the original version (which still wants for anyone with 'tagger' and 'MacII. Oh, and you'll need at least 2Mb of RAM.

Essentially, SoftPC provides complete 80286 PC compatibility for your Macintosh. The tech specs of the emulation are: emulates the Intel 80286 processor (Real Mode, 256-4096 of PC RAM, CGA, two serial ports, an parallel port, drives A: floppy drive, C and D: hard disk documents, a Mac folder access, MS-DOS 3.0 is installed, pre-installed.

The application runs entirely in software, and although I've not had a chance to use the new version, we've had the original SoftPC in the office for a while and it really does provide excellent compatibility. We even managed to get PC games to and

POSTCARD FROM AMERICA

The new year is at hand and everyone's glowing with an overwhelming flood of optimism, tempered with a liberal splash of industry realism. Or is it? (before Schlegel) There are so many things to look forward to - hard drive crashes, faulty interfaces, and lots of fun. You can imagine my mixed frame of mind when the postman dropped off the Horizon 1.01 update of Aztec, Microsoft's digital handwriting.

The upgrade was done to fix "pathological misrecognition." Their technical support reported that the "Ascendant was off by several degrees." Thank heavens they've fixed the program! When I thought of the many world leaders using the program, believing in accurate prediction science available, and having important decisions of international consequence on the results, it made my knees tingle by its magnitude. To say that Saddam Hussein's invasion of Kuwait was off by several degrees. Truly.

Aztec would be a lot of fun at parties, or perhaps a new Mac business opportunity. It involves dilly and sassy horseshoes, as well as charts for years.

Predictions are divided into subjects, careers/finance, family/friends, conflicts, and romance.

The accuracy of the predictions mean little to me. I've always been off by degrees.

The weekly meeting of the Berkeley Macintosh Users Group has been featuring Top Ten Lists. I must take the blame on this one.

1. The Top Ten computer pickup lines:
10. Is that a modem in your pocket, or are you just glad to see me?
9. Of course our forecasts are compatible!
8. I've had 28 four eyes on you, Baby!
7. Why do you think they call them "Comments"?
6. Moooo, you small deer is that real, or flux renoise?
5. You've got the bestlines I've been searching for.
4. Spread sheets are my specialty.
3. I can bench press four Macs. Portable!
2. You know what they say - hard drive, hard -
1. Sure I'm a user, Baby - but aren't we all?

David Morgenthau

raming – although that's where the one problem really did show itself: the emulation is atrocious. While some reduction in speed is to be expected – after all, the poor Mac is having to be a Mac and a PC at the same time, all from the one CPU – some games really were unplayable, even when played on the Mac too, the second-fastest machine in Apple's range.

Still, if you have a vast collection of PC programs that you want to run, and you don't mind playing them at a rather lesser speed than you're used to, SoftPC offers a reasonable answer to your prayers. Coupled with another program from Imagic, AccessPC Version 1.1, which allows you to mount 3.5-inch PC disks on the Mac by just slapping them in the disk drive – no messing about with Apple File Exchange – and you could easily forget that your Macintosh was anything other than a PC. After all, that's why you bought it, isn't it.

Both programs will ship on February 7th from Imagic Solutions 00494 4094261. Retail price for SoftPC is \$199.95, and \$129.95 for AccessPC Version 1.1.

HURRY, HURRY, HURRY

If you rush, you might just be in time to catch the last call of MacSolutions' January sale.

If you need a disk drive, these are the people to see: you can get an external 20MB unit for £240 plus VAT, if they have any left; for £275 plus VAT for a 210MB drive, for the memory hogs among you. The company also tends to have small quantities of software at radically reduced prices; for example, in the latest price list they had eight copies of MacPaint at £50 each.

Contact MacSolutions on 0635 660001; it's open until 7pm, Monday to Friday.

Ian Whigley

PC

YOU'VE NEVER HAD IT SO GOOD!

The latest word on those Amstrad prices (although you probably already knew it if you've been sniffing around the shops) is that the major stores have cut £20 off the price of the £14000 model to sell it at the £120 mark, while the £128 Plus is down from £430 to £380.

It's all great news if you've been dithering around, not sure whether to buy one of the new machines or not – not so good, of course, if you've already bought one at the full launch price. Yes, there are going to be a few people a bit miffed with Amstrad right now, but the Silverwood company is obviously more worried about achieving a big market penetration quickly than anything else.

HARD TIME FINDING A HARD DRIVE?

Does anyone remember the news story about Siren Software and the company's planned hard drive for the CPC? Think of the advantages... 20MB of data storage in one unit... no more floppies to fiddle with... no more lost files... no more desk-top clutter... no more lost files... no more sign of a hard drive in the event, either.

To be fair to Siren: Cobb of Siren, he did make it clear that the hard drive was only an idea, and wasn't actually planned in any real and concrete sense, or at all... (Thank two good angels into enough trouble by now).

Well anyway, those still hanging for a hard drive for their Amstrad will be interested in this snippet from Glen Scott of Great Yarmouth:

"...you can purchase a 20MB hard drive from Fritz Oberweiser Computing Ltd. The cost is about £380. Telephone on 0149 495732 3346..." A German number.

NORTH AND SOUTH

French software houses have always had a bit of a reputation of original, innovative and, well, weird games. And the latest offering from Imagic.



North and South: Your tactical map, and the nerve centre of your whole campaign.

North and South £9.99 cassette, £14.99 disk, as no exception.

Actually, N & S is more original and innovative rather than weird, based as it is on a real-life historical conflict, the American Civil War. It's a tactical war game at heart, but what sets it apart from most computer war games is that it's actually interesting... no, sorry, I mean graphically interesting. (Then, close one that.)

The strategic part is a map of the Eastern USA which helps you move your armies from state to state. The aim is to capture enemy forts, pillage towns and wipe out the enemy's forces wherever. Forts and railways are the key, because whenever you capture and hold these two you get bags of loot with which to buy new armies.

The fort and train-laying sections are pure arcade action. You control a single character racing along the roofs of the carriages for the forts, or fortifications armed only with a large supply of throwing knives and his fists. As if this eleven-hour crusade wasn't enough, you've got to complete the assault within a time limit.

The third part of the game involves the battles between armies. Each army consists of an infantry section, cavalry and artillery. You can control each independently, and it's up to you to find the best tactics on the battlefield.

N & S's graphics are quite superb. They're colourful, detailed, well-

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North and South: You've got to capture the last single-handed within a time limit!

animated and very fun (mostly they're done by famous French cartoonists Lambi, apparently). Even better is the sound, interspersed with wondrous Carl Weis-type tunes.

The whole package is really quite remarkable. The various sections of the game are excellent in their own right, but have been put together into a varied and riveting whole. Just because it's a Carl Weis "simulation", don't expect a history lesson. Expect instead a fun and challenging, epic that'll keep you busy for a long time.

NARCIS POLICE

I'm still trying to get to grips with this one. Basically, Spanish version house Dinamic's New Year release is a rather complicated tactical action blast that shoos a damned sight more gameplay than meat - including Dinamic's usual offerings. It does - only kidding, folks.

The idea is that way in the future the drug barons have become so powerful that conventional law enforcement bodies are incapable of dealing with them. Thus a special squad of elite crime-busters has been put together from the world's best, sent to invade and destroy the yolkie base, situated on a tropical island.

This is where it gets complicated. There are five tunnels into the base, all guarded to varying degrees. You have three groups of five men, armed with a variety of weapons which you choose yourself. You need in one man at a time, but can switch from one group to another at will, as well as carry out a variety of other actions as your Personal Security Unit, which is displayed on the right of the screen.



DTP WONDER

It's finally here. After months of waiting, SoftLogic's PageStream 2 desktop publishing system has finally been released as its 1st new technical UK game. Thanks to those nice people at Silica Systems, I've been playing with this new program for a few of weeks now, and can safely say that I'm very impressed.

PageStream has been floating around for just over a year now, but previous releases failed to impress. The original PageStream was about as stable as a South African government, but this latest release seems very stable indeed. It about three days solid use, I managed to crash it only twice!

For those of you who have never had the good fortune to use

it that the last? Nope. You can also opt for a full-sized and which will let you learn in reinforcements at the appropriate moment.

Now for the even more complicated bit. You can reach computer terminals at certain places in the tunnel network, and activating these will let you score points in other tunnels to let your other groups through.

In play, your man moves a little bit slowly, but the graphics are otherwise excellent and very atmospheric. It's a bit too easy to be killed, but otherwise the game is pretty playable. If I ever get to plant my demolition charges in the heart of the enemy stronghold, I'll tell you how, but in the meantime, you might want to give Narcis Police a whirl. It's rather nicely done, rather deep and very different. I'm not sure yet whether it's a great game or just a good, tough one, but either way, I'm giving it a thumbs up.

SATAN POKE

While we're on the subject of Dinamic games, the devilish Satan will no doubt have been going a few of you problems. Fear not - here is an inflation book poke (look version for both parts from Andy Price, UK, and the access code for part 2 is 00020004).

1 F SACR Cheat, M0504

1 F by M0504 PRICE

10 DATA 21,00,01,11,00
20 DATA 06,04,61,61,83
30 DATA 20,01,00,01,81
40 DATA 10,03,01,00,01
50 DATA 05,09,21,05,00
60 DATA 22,75,01,21,05
70 DATA 09,02,09,01,01
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90 DATA 25,04,03,01,00
100 DATA 09,75,01,01,01
110 DATA 34,09,01,01,01
120 DATA 01,01,01,01,01
130 DATA 01,01,01,01,01
140 DATA 01,01,01,01,01
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160 DATA 01,01,01,01,01
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190 DATA 01,01,01,01,01
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Rod Lawton

PageStream, it is a professional-standard desktop publishing system that can handle anything from simple business cards to online magazines. Version 2 of PageStream includes full support for colour fonts, such as those used by Professional Page, therefore allowing you to produce text which will print at the highest possible resolution without jagged edges. PageStream supports CompuGraphic CS-format fonts and Adobe Type 1 and 3 PostScript fonts, as well as SoftLogic's own brand of outline fonts.

SoftLogic very generously hands out a total of ten different fonts (all which have an of CompuGraphic format, so there's plenty from which to choose. Not only that, but it should also be able to take advantage of fonts designed for

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• PageMaker 4 on the Mac PC version due any day.

Adobe: The main change is the addition of a mouse-driven drop-down menu system which makes the program much easier to use. Version 4 can also handle several maps without having to quit and launch a second version of the program. The maps currently

the English language with such Americans. Aldus is not renowned for being reliable when it comes to these announcements, but this time I believe it if only because it first told me it would ship last September!

The new features of PageMaker 4 (version 4.1 from the best DTP package on the PC is, well, the best DTP package on the PC with a pretty good claim to the best document processor as well. A story editor is added which gives full word processing functions at word processing speeds - spelling checker, search and replace and the rest.

Typographically you can rotate, compress and expand text - even on a non-PostScript printer, thanks - a la the building of Adobe Type Manager, which also contains a superb screen display.

There are dozens of features to help with creating long documents, such as indexing, dynamic links to document files and the creation of multi-chapter books. A Table Editor allows tables to be designed and placed easily.

The only down point to PageMaker 4 is that it requires 2MB of memory to run - but if you have a PC running Windows with only 1MB you more memory tomorrow, it makes a huge difference.

Interestingly Aldus will continue to sell and support PageMaker 3.0, which doesn't have the 2MB requirement. 3.01 will sell for £515. As for the best program of its type, PageMaker 4 will cost £250 plus VAT, or £300 to upgrade. Aldus is on 031-220 4747.

FOUR AGAIN

Another program which has just gone on to version four is the road planner

available as France, Britain, and Europe.

The garbier editor now contains database-like search options, and the ability to place this information in windows on the map. Pictures can be added to maps in this same way. Profiles of maps are improved thanks to TMS support.

The UK version costs £345, with the European one coming in at £345. NordBase is on 0708 460077.

Currently in development at NordBase is an add-on module which will allow the program to interface with a satellite-based positioning system. The exact location of the vehicle can then be used to update the route and ETA, and this information can be relayed back to allow a coach firm, say, to keep track of all its vehicles.

FOUR MORE

What is it about version four? Here's another one: PC Globe 4.0. PC Globe is an atlas and gazetteer program which includes copious information on every country in the world.

The new version is pretty up to date - including information on the unified Germany for instance. Other new features include climate graphs, flags of the world and the ability to play the national anthems of every country on the planet.

Still there, of course, is the point-and-shoot map interface and statistical information on everything from numbers of doctors to potato production, with the option of graphing comparative figures.

PC Globe is available direct from the USA for \$49.95 plus \$13 P&P. Call 0101 602 730 9500.

Stuart Anderson and Steve Platt

64

RANDOM NUMBER GENERATORS

There are lots, damned lots and press releases. In a recent post to these parts, Commodore's Andrew Bell told us that he reckoned in the region of thirty thousand OS-400 units had been sold over Christmas. Within a day or two I received a Commodore doc'n-downed press release claiming that a mere modest "nearly twenty thousand" of the machines had been picked up by punters.

Commodore's arch-rival Atari couldn't resist getting in on the act and said the

figure was closer to 14,000. Either way, these aren't the kinds of numbers Big C was hoping to be quoting. Nevertheless the company remains confident about the machine's prospects for this year, with the impending release of even more cartridges.

LET'S NOT GET VINDICTIVE

And on that subject, I was wrong to be optimistic about Denmark's first post-Cyberball release. While R1581 bugged into oblivion unlike Cyberball,



• Two screen shots from Star Control which combines elements of strategy games and a good dose of healthy arcade action. But you can guess which is the most fun.

It's about as exciting as John Major's style in spectacles.

Visitors is a one- or two-player tank bash, set in the vast space stations of some evil empire. The interior decor of these ships optimises the most xenophobic of tastes, favouring gun emplacements and mines gal in your way as you try to collect fuel supplies and strangely important shrinking stars. Should you be lucky enough to come across a rather large key, you can escape to the next of the game's 14 levels.

Only other hostile tanks and bombards stand in your way. The whole affair is phenomenally tame and uninspired.

HEDGEHOG FLAVOUR

Almost alone among the recent releases as an example of what you can do in a game, even without all that expensive RAM, is Creatures from Thames.

You play a fuzzy little blob called Clyde whose hands have been captured and placed in a torture chamber by some demons who inhabit the small Pacific island where they live. Now Clyde has the unenviable task of rescuing them. He uses a number of breath weapons in his progress through the archipelago, eating energy boosts and dodging the demons' various minuses along the way.

Creatures from Thames is a gorgeously colourful non-violently scrolling game. The animation is the best you'll have seen in a long time and it's brimming over with funny details such as Clyde's use of a fan to propel his little gaid across rivers.

At the end of each of the four challenging levels is a torture chamber in which some bizarre device is being employed on one of Clyde's captured companions. It's worth wishing what will happen to the victim should you not hit a finger to help. Their deaths are varied, graphically grisly and really funny. This should win an award for the most blood in a C64 game and is the best reason I've come across for not having a GS.

WE ARE NOT ALONE

Just converted down from mindbogglingly large IBM compatible machines is Accolade's Star Control. It's a space colonisation and conquest strategy game with arcade-style elements thrown in for good measure. These come whenever there's a confrontation between ships in the Hierarchy fleet and the ships of the Alliance (humans).

Each side starts with only one spare station and must build ships, explore nearby worlds, mine them for income, fortify them for defence, colonise them because otherwise the colonists would have nothing to do and eventually unite all the hard work the other side has done.

When ships from both sides meet, the play leaves the stellar map screen for most of the game and replaces it with a fluently impenetrable screen which forms the arena for the forthcoming space battle.

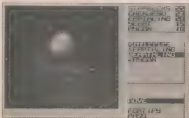
Each side can build ships with different capabilities and weapons so early battles are exciting and difficult to win but only one ship per side ever meets in a quick battle.

The strategic element is predictably unappealingly widely felt the arcade head-bashed battles are fine. What's more, a host of game options give the game extra depth.

Control of either side can all given over to the computer to a lesser or greater degree (this is useful as normally you have a choice of either a human or a computer opponent and that's it). Each side can be made better or worse than the other and there are practice modes to help you get used to the different kinds of vessel which you can build.

The main fault of Star Control is that only one player can use a joystick and the manual follows the tradition of being both despondently laze without conveying essential information clearly, and independently null in terms of its self-dependency and boringly science fiction content. Other than that, it makes a challenging strategy bash.

Sean Masterson



• Yet another world which you have to colonise before your opponent does in Star Control.

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DOUBLE SLICK

I mentioned last week that Double Click software had been at the iS44 computer fair showing its increasingly large range of productivity software. I have now acquired the company's revised CD Utilities and the eagerly awaited CD Desktop.

CD Utilities V2.0 is a selection of programs designed to combat all those horrendous problems you run into when using your ST for something other than games. New programs are included on the disc: a fast RAMdisk, compression and extraction utilities, a macro program and a screen grabber. The most useful is a CD Abort Plus. This nifty program enables you to decompress or compact in four formats, extremely quickly.

The CD Desktop looks set to rival Needles 3, that other professional-looking OEM replacement for Ghost. It has all the main features of Needles but is still lacking in some areas. Icons and folders can be placed on the desktop. Spigot icons can be created for files, folders and drives. A virtual disk drive (called the cabinet) lets you quickly access obscured files. Picture files can be viewed from the desktop. Trashed files can be recovered. Keyboard shortcuts speed up desktop usage.

A SOUND EDUCATION

C-Lab, the purveyor of quality music software and hardware to the public, has released some new titles. The most interesting is Taking a MIDI education package. Taking a very 'hands on' approach to MIDI functions, Motivation gives you the result of each key press on your synthesizer. For example, when you move the pitch bend, a graphic and a textual explanation appears on screen. Thus you can learn just by playing around with the ST and the synth. The manual is well written and reads you through the program, if you're baffled by inbuilt technology then give the program a go. It costs £55.

Aura works along very similar lines to Midas. However this program deals with standard musical

conventions. The program sets you a series of exercises on subjects such as intervals, chords, laments or rhythms. This program would be of particular interest to schools as it combines technology and musical education in a very professional, versatile package. Aura costs £39.

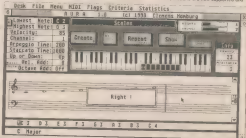
As a special offer you can buy these two plus Able Notator, which retails for £150 as its own, in a bundle for just £345. All are available from Sound Technology on 0462 480000.

LET'S TALK MAC

Gadgets by Snek, producer of the Spectre GCR Mac emulator, has been

quiet for the last year. However it has just burst back into the limelight with two new products and some revised software. The Spectre GCR was acclaimed for its excellent compatibility with Mac software... you could simply place a Mac disk in the ST's drive and run the software.

Version 3.0 is now ready and it boasts some extremely impressive features. The interface has been completely updated and includes the options of switching in and out of SCSI (choosing a partition before Mac boot) and extra memory availability. Game functions have been overhauled, 16 hard disk partitions are now supported and



• Here, one of two new musical education software packages from C-Lab.

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WHOLE WIRED WORLD

Globetrotting Steve Gold this week files a special report on the CES in Las Vegas and has news of an exciting innovation for couch potatoes.

DIGITAL COMPACT CASSETTES

Philips and Sony have put their heads together and come up with a digital tape system that draws heavily on the technology the two companies developed for the compact disc in the early 1980s.

Called the digital compact cassette, (DCC) the tape recording system uses tapes the same size as existing analog cassettes, allowing your favourite CD to be played in a DCC machine. The advantage, of course, is that DCC uses a variation on the digital recording technology seen in the digital audio tape (DAT) cassette system.

Initially, DCC is seen as a consumer item, although Sony officials say that computer applications are possible once

the price of tapes falls. It's worth noting that DAT cassette technology has made some inroads into the computer market.

The key question is, of course, whether the industry really needs DCC. DAT is, at last, establishing itself as a digital tape format, so we could have a rerun of the Beta versus VHS video tape format war on our hands. It's a good pity that DCC was not released a couple of years ago instead of the DAT system.

I could be cruel and say that both Philips and Sony have produced cassettes "tortured" in the past. Philips developed the obsolete V2000 video format in the 80s, while Sony produced the Elicassette elapshandio audio cassette in the seventies.

Shipment date for real money! DCC products is a year from now say Philips and Sony. That's more than enough time for DAT to firmly establish itself in the market.

ATARI FIRES ALL US SALES REPS

Atari has issued redundancy notices to the its six full-time national sales representatives, according to the ST Report newsletter.

The sales reps have been used in the past to promote Atari's products to dealers across the US. Word is that, in a bid to cut costs, Atari plans to service its dealers directly from headquarters. A strange thing to do in the middle of an effective relaunch of the company's games products.

COMMODORE US CUTS JOBS

Meanwhile, Commodore US has announced that around 66 of its 600-strong workforce are to be laid off. The staff cuts are primarily on the administrative and factory side of things and do not affect the 2,400 other staff employed outside the US.

Obviously, the layoffs are due to the reorganisation of functions within Commodore US, as well as the result of improved operating efficiencies. But reaction from the on-line community reveals that the cuts were not entirely unexpected.

MAC PORTABLE MK II NO-SHOW

John Sculley, Apple's CEO is reported to have been "horrified" with his technical support staff when they failed to get a working version of the Mac Portable MK II up and running in time for Mac World Expo in San Francisco earlier this month.

According to the Byte Information Exchange (BIX) on-line system, the machine is now permitted to be shown at the machine in late January, although it's no good chance in the technical advances department. The LCD screen

is now backlit and the weight has been reduced slightly.

This has been made possible, say Apple sources, by the inclusion of single inline memory modules (SIMMs) in place of standard RAM chips on the Portable. This cuts down battery consumption to the point where a backlit screen is possible.

All of this is merely a stop-gap, however, as Apple is reported to be feverishly working on a true successor to the Mac Portable for launch later this summer. My money is on a Comrade Spring launch this June.

INTERACTIVE TV COMING SOON

The Federal Communications Commission (FCC) in the US has announced that it has licensed the radio frequencies necessary to support a system known as interactive television.

Interactive TV works without the need for a phone and allows any TV viewer to key in commands on a special keyboard. The commands are transmitted to the TV station which then sends back the requested information to the viewers television set in the form of a still picture.

The technology is very simple and bears a passing resemblance to the interactive teletext service seen on the Decade and Comdex systems, except that standard TV definition images are used.

The FCC reckons that handsets with a suitable radio transmitter can be produced for around \$100. The console plugs into your TV and the TV aerial plugs into the console. Simple.

The idea is that viewers could access simple information on how television screens — such as pictures from estate agents, bank statements and the like — using a cheap game, and charged similarly to a telephone bill.

BUT the FCC envisages the idea that television audiences could vote using the system; there simply isn't the channel capacity available. ■

PANTHERS, LYNXES AND CDTV AT THE LAS VEGAS CES

PANTHER AT CES

Atari presented a private showing of its new Panther console at the CES in Las Vegas this month. A 68000 microprocessor based games console it is reportedly backwards compatible with the Atari ST and the Lynx hand held console. Little else is known about the machine except that it is expected to be launched at the Cebit Fair in Hannover, West Germany, in March. Don't expect shipment until the summer, however.

BUDGET LYNX

Undoubtedly in response to the major threat posed by the Nintendo Game Boy, Atari rolled out a budget Lynx at CES. Priced at \$99.95 — compared with the standard \$149.95 machine — the budget Lynx has a redesigned case and a slightly smaller colour LCD screen.

What about the existing Lynx? Atari

is approaching the machine from the same sales angle as it did with the Panther at last November's Consumer Fall by marketing it with a variety of add-ons such as Com-Lynx cables, mains adaptor and two game packs. The Lynx computer/move/kill will continue to sell for \$149.95.

LOADS OF LYNX SOFTWARE

Atari announced five more games for the Lynx at the CES, taking the total of available titles to 16. The titles are Rampage from Bally at \$34.95, Award Byster from Atari at \$39.95, Zerk Mercenary from Epyx at \$24.95, Rygar from Tynes at \$29.95, and My Prisoner from Namco at \$39.95.

Other Lynx titles announced for release later this year included World Class Soccer (Atari), Ninja Garden (Technic), Shockout (California Dreams),

Yzorb (Atari), Warbirds (Atari), NFL Football (Atari), Shanghai (Mastaglio), Golf Runner (Atari), Turbo Sub (Atari), Checkered Flag (APR), Scarydog Dog (Atari), and Tournament Cyberball 2072 (Atari).

CDTV FINALLY UNLEASHED

As expected, Commodore rolled out its Amiga CDTV system at CES. Shipment to six US cities is planned for next month, with volume shipment in the US following on in May and June.

The 1994 system is being pitched as an interactive CD-ROM disk reader for single control as a standalone unit, or for peripherals connection to other machines. It can also double as a compact disc player.

By the time the CDTV system appears in the US shops next month, Commodore reckons there will be 35 to 40 CD-ROM disks produced specifically

for the machine. By Christmas, the company expects this figure to have risen to around 100.

DISAPPOINTING SALES

All the major computer game console companies were agreed about one thing at CES: sales of games consoles are up on last year, but very below what industry experts had predicted.

This is blamed on the recession and the current Gulf crisis as causing the reduced rate of growth in the market. The computer games biz in the US was worth \$4,500 million last year, compared to projections of \$5,100 million. The 1989 figure was \$3,400 million.

Nintendo admitted that its sales fell short of predictions. The Japanese giant reported US sales of \$2,000 million, compared with a forecast of \$4,100 million.

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The Philips 15" FST TV includes: remote control, Sport link, 60 tuner presets, sleep timer and Fastback. All displays include Sport cable. Deduct £10 from Monitors only if bought with computer. The Philips 8833 comes with full 12 months on site warranty.

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PD NEWS

Commissionware is a new PD-related service which promises to give programmers rewards for their efforts. The new label has been launched recently by Trust PD, who will exclusively distribute the software.

The scheme will give the programmer a 50p royalty on every disk sold. Though the disks will sell for normal PD prices - £3 a disk - they aren't actually public domain. So if you make fancy your latest Commissionware program, they will have to purchase their own copies, and won't be able to take a quick copy from you.

If you think you have any software worth logging through the Commissionware label, you should write to David Palfin, 3 Beacon Road, Stansted, Wigan, WMB 05S.

THE PD COLUMN

Relive the psychedelic Seventies, teach the kids how to count and blow up an alien civilisation all for the price of a few blank disks. Adam Waring tells you how.

If, on the other hand, you're a purist rather than a programmer, you may like to buy some software that's banalised to the person who's gone to the trouble of producing the software. (Indeed, you may be interested in logging through the real PD section.) Sales are at Trust PD, 88 The Park, Southwem, Dorset, PO21 2JY. Telephone 0422 241855.

Kozmic - ST - Floppyshop ST

Wow man, that's like really far out. I think I'll just live here, under the tree, and mellow out for a while...

Kozmic is a psychedelic pattern generator. You draw geometric shapes, splodges and patterns with a simple set of icon-based commands. The colour palette can be changed, and when you're happy with your mind-blowing

image, you switch on the colour cycling and sit back and enjoy the 'experience'.

It's dead easy to create the patterns. When you've come up with the hippest pattern visible, it can be saved to disk, ready to be loaded up when you want another 'experience'.

Ecoduc - ST - Budge UK - BU41

Ecoduc is a shoot-'em-up from the distant reaches of the galaxy (well, actually it's from Budge, but there is such a thing as an alien planet). Set on the surface of a metallic planet, you have a mission to 'kill' all everything that moves and leaves the planet devoid of life.

This may seem a bit rough. After all, they've done nothing to you, and you are visiting the planet with the express purpose of destroying them. But they are aliens, and deserve to be annihilated.

Your ship can travel in eight directions. Robots roam the planet's surface and you blow-'em up and shoot you out of the sky. You have to weave through the

WHERE TO GO FOR THAT ESSENTIAL PD SOFTWARE

The programs mentioned on these pages are available from many PD libraries including...

TRUST PD, 88 The Park, Southwem, Dorset PO21 2JY. Tel 0422 241855. If you're stuck for software for your ST, then you can trust these good people to sort you out. Single sided disks are £1.75, and double sided are £2.55.

RIVERGATE PD, 36a School Road, Ebbw Vale, Rhondda, Gwent NP23 5AR. Telephone 0754 452416. Rivergate boasts PD collections for both the ST and Amiga. Most of its disks £2.55, they also have special PD packs for just over £3.

BUDGE UK, 5 Mister Cress, Rayleigh, Essex SS6 8SF. Although synonymous with the PD scene, Budge's programs

aren't actually PD at all. A small registry goes to the programmer for each game sold. Most programs cost £2.95, and are available from many other PD outlets as well as direct from Budge.

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shower of enemy fire, blasting the robots to bits as you do so. Finish your merciless task and you're whisked off to another world, with another civilization for you to destroy.

It's a pretty game - the background looks like it's made in Sheffield, with the bar-relief surface showing where tight packs of cut, and in a shadow where the rays don't reach. The sound is appropriately shoot-'em-up-ish, consisting of lots of explosions and laser fire.

ST Programmer - ST - Rivendene PCL £881

ST Programmer is yet another magazine on a disk. The difference with this one is that it's aimed at those who really know their sugar, and it's those who really like to. There are plenty of tech articles in it. The first issue, covering topics like STOS Basic programming and 68000 coding.

A six issue subscription will cost you £12. Overseas readers need not fear left out - C16 will ensure that they receive the mag too.

Three Games - ST - Trust PD - Educational 10

It's time you were given a lesson and the disk could do just that. It has three games on it, written with the purpose of making learning fun.

Learning to tell the time is the purpose of Time Teller. You're presented with an analogue clock face, and how to

convert it to digital on a digital watch. It uses the 24 hour system, so you'll have to be a bit of an advanced time-teller.

Then there's your counting and adding skills. An engine has to pull a certain number of people in various sizes of rolling stock. The thing is, you're only allowed to use certain configurations of coaches. So you may be allowed two- and three-person carriages to take 10 passengers. A bit of a tricky beggar, it can tell you.

Make a complete pig's ear of the whole thing, and you're told that you're really a very stupid child indeed and can play with it here. If you're got it right, only joking - the computer explains to you how it should be done, by showing you an example that does add up.

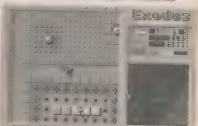
Search puts you on the hunt for your missing girlfriend who's stuck inside a book... ah, maybe I should have mentioned that you're both bookworms.

You have to choose your way through the books to find her. The trouble is that there are one hundred books in all so it will take you ages to search through the whole lot. Luckily, you're given a clue. A thermometer tells you whether you're hot, warm or cold. You can use this clue to home in on the correct area until eventually you find the missing girl.

Then the disk thing only goes and gets lost again. So you have to do repeat the whole thing. ■



Exodus: Crash Bandi's hard disk. But it's educational! Really!



Teletext kids to meet with dragons on the Three Games educational disk

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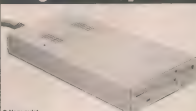
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DYNAMIC DATA

The data structures that we have already seen were static structures; the size and configuration of these has to be fixed before the program runs. This allows you to estimate memory requirements and performance more accurately, but not all data is input to a program in a suitable form for this. If you cannot be sure how large a structure will need to be to hold the relevant data, you will have to make it large enough for the worst possible case, which can eat into resources as it will increase the time taken to retrieve data.

Both the size and configuration of dynamic data structures can change during the program run, as the data storage needs of the program change. Another advantage is that a method of removing used data is frequently built in to dynamic structures, whereas arrays and hash tables will tend to provide only methods of storing and accessing data.

Where a program accepts data as input from the user, the data will often be supplied faster than the program can process it. Data read in from disk or typed on the keyboard needs to be stored in a buffer of some sort until the program is ready. If data could not be buffered in this way, you would not be able to type ahead in a word processor while the page was reformating, for example. An area of memory is usually reserved for the keyboard buffer, but this may be inadequate; the keyboard buffer on an IBM PC has only 16 positions for storing characters.

The volume of this data cannot be estimated in advance and the storage requirements will change frequently during the program's run, so that dynamic data structures are needed for any process that requires data to be buffered and resources to be allocated.

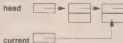
Dynamic data structures are self-referential. Each member of the structure also contains a pointer to the next member of the structure.

A frequent use is for calculating arithmetical operations; the data needs to be stored until the entire calculation has been entered, so that operations are applied in the correct order. This structure used for this is a stack.

A stack is a linear data type that provides Last In First Out (LIFO) storage. This means that the last item

The storage and structure of data can involve complicated calculations, so Mary Branscombe takes you through step by step.

SINGLY-LINKED LIST



placed on top of the stack must be removed first. A stack functions in the same way as a stack of plates or trays. Items are pushed on to the top of the stack, on top of preceding data, and popped off in reverse order. Stacks can thus be used to reverse sequences of data. The bottom of the stack is known as the base and the next free position in the stack is the top.

Using dynamic data structures allows you to deal with situations where you cannot predict how much data you will need to store.

Dynamic structures are used to store data input to the program, from the user, the CPU or a disk drive.

Stacks and queues are used for many Operating System routines.

Most computers are stack-oriented machines and stacks are commonly used for saving the machine state while the routines that service interrupts complete their tasks, for passing parameters to functions and for keeping track of objects like overlapping windows.

Reversing the order of the stored data in this way is not always convenient. The queue provides First In First Out (FIFO) storage, so that data leaves the queue in the same order as it arrives. The oldest data in the queue is stored in the head of the queue and the most recent in the tail. An enqueue or join operation adds data to the queue and a dequeue or leave operation retrieves data from the head of the queue.

DOUBLY-LINKED LIST



Queues are typically used as buffers for CPUs and disk drives and for event simulators.

A more complex form of the queue is known as the double-ended queue, the deque or the dequeous. This is a simple FIFO queue with two extra operations that allow data to join at the head of the queue and leave from the tail, if required.

The length of a queue obviously limits the amount of data that can be stored at any one time and objects that need to optimise the amount of storage available are often implemented as circular queues, where the contents of the tail can be extended into the memory used for the head, as this is free. One position in the queue is needed to store extra information and to mark when the queue is empty.

Each data item in a linked list has a successor, with a pointer to this. Moving backwards through a singly-linked list to find predecessors of items can be difficult, but a doubly-linked list can be used, where each item contains a link to both successor and predecessor.

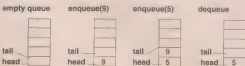
For data that needs to be organised into a hierarchy, a tree can be used. The initial data item is known as the root, other items in the tree are nodes and terminal data items are leaf nodes. The various specialised forms of trees are given by restrictions on the simple form. A binary tree, used, amongst many other things, to implement lists in Prolog, is a tree where each item must have two descendants, which must be either a null item, or a new data item.

A graph or network is a generalisation of a tree, where every item has a number of successors, which can be either items in the graph. Technically speaking, a tree is a Directed Acyclic Graph - the data hierarchy is given a direction, and paths through the tree must not loop or form circles. Again, specialised graphs are formed by adding restrictions to the original graph.

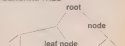
A FIVE POSITION STACK



A FIVE POSITION QUEUE



GENERAL TREE



GRAPH



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IS IT ALL MOONSHINE?



• Drinking and driving? Drive to drink? Or just driving it?

Now that the new year is well underway there are codes of games waiting to be released.

Millennium has announced its forthcoming nutty racing game, *Hillybilly Moonshine Racers*, which puts you in the driving seat of an old jalopy. You're a good ole boy, earning a bit of extra cash by driving an ancient pickup truck full of idiot moonshine wherly.

However, as you'd expect, the law (in the form of Fat Sam the Sheriff) is not happy with the situation. On your cross-country chase you have to elude Sam and deliver the moonshine to Tucker's secret moonshine highway in one piece. He'll cough up the dough for the run, helping you to buy maps, CB radios and upgrade your wee-hicks.

And boy, does it need upgrading! It gets bashed to



GAMES WEEK

Neil Jackson gives you the low-down on the latest playing tips and cheats.

stilted and back on every run, with lichen trees, road-blocks and ambushes all taking their toll. And worse, other moonshiners will be pushing past you at every opportunity, slamming you off the road and smacking your motor!

Hillybilly Moonshine Racers is the work of the team that wrote *Chase HQ* and *Continental Cruise*, so you can be sure that the racing part of the game is up to scratch. In addition, the game features three difficulty levels, each with five different routes and a whole host of tricky obstacles. Watch out for the Moonshiners' burner rubber across Tennessee (and your computer) some time in March.

Another software house with lots to offer over the coming months is Greenin, which will release three games between now and Easter: *Due in March* is *Switchblade 2*, the follow-up to... er... *Switchblade*. It's set

two hundred years after you (known as Hiro then) defeated Hiroko in the original game. Sadly Hiro is dead, as Hiroko was thought to be. But Hiroko has risen again and Hiro's descendant is the only living person who can stop him.

The game features six levels, each containing over 100 screens of action. Redrawn graphics depict the various areas of the land, from the *Switchblade* Underworld to an explosive volcano island. All manner of weaponry lies at your disposal: if you can lay your hands on it, spin blades, machine guns, firebombs, lasers, gas grenades and homing missiles all have a shelf in your armoury. And you need them! Cool Gadgets, dude, laser turrets, terminators and even apples are aiming to destroy you.

Another Greenin goody waiting in the wings is *Supercard 2*, follow-up to... er... *Supercard*. Created by the Lotus Turbo Challenge team, *Supercard 2* also offers simultaneous two-player racing action. The game features 20 improved racing tracks and an upgraded weapons system which includes machine guns and even homing missiles. Look out for this in April on the Amiga and Atari ST.

Perhaps Greenin's biggest coup is the securing of another hot licence deal - *Ulti Quest*. The best-selling board game of 1989 is destined to become a similarly hot title in its computer form.

It's a fantasy adventure where elves, wizards, barbarians and dwarves battle with dark forces in search of hidden treasure. There are more than five different quests and a choice of characters to take on them. Each adventure develops his skills as he progresses deeper into the quest and you can save your current abilities to disk as you go. Greenin promises fantastic graphics and superb graphics for its Amiga and Atari ST sometime this Easter. Watch out for the full review in a future Games Week. ■

TOP 10 SIXTEEN-BIT GAMES

Rank	Game	Platform	Score
1	Demolition Man	Amiga	9.0
2	Demolition Man	Atari ST	8.8
3	Demolition Man	Amiga	8.8
4	Demolition Man	Atari ST	8.8
5	Demolition Man	Amiga	8.8
6	Demolition Man	Atari ST	8.8
7	Demolition Man	Amiga	8.8
8	Demolition Man	Atari ST	8.8
9	Demolition Man	Amiga	8.8
10	Demolition Man	Atari ST	8.8

For the week ending 26th January 1991
ST - Atari ST Am - Commodore Amiga PC - IBM PC or compatible (2) - Other
Client compiled by Gallup, European Leisure Software Publishers Association

INDIANAPOLIS 500

Can you handle life in the fast lane?

This week, we have some in-depth tips for Indy 500. *Electronic Arts'* racing masterpiece. As all-round excellent game, Indy 500 suffers from only one problem - it's incredibly tough! For better qualifying times, check this little list.

- Fill the fuel tank to 10 gallons for qualifying, or full to the brim for a race greater than 30 laps.
- Set the rear wing on its top notch and the front wing one notch down from the top for qualifying. For a race, bring both wings down by 3 to 5 notches each, always keeping the front wing one notch lower than the rear.

- To qualify, use soft tyres on the left and medium tyres on the right. For races, harder them up, using a medium left-hand right combination.
- Set the stagger 3/4 plus one inch for qualifying and racing alike.
- Keep tyre pressures between 26psi (which is fast but makes steering difficult) and 24psi (which grips well, but is a bit slower) for both qualifying and racing.
- Shock absorbers should be set up two notches up from the bottom setting to maintain a steady grip through hard and gentle bends.

- The camber is best left at the default setting.
- Gear ratios affect different cars in different ways. For the Penske, set it up so first gear is at 10.00; for the Lola first gear should be two selections lower or the engine blows up.
- Set the front anti-roll bar to maximum stiffness. Set the rear one to two or three notches stiffer than the default setting. Never set the rear to maximum.
- The turbocharger should be set for maximum boost all the time. It adds fuel, so you may wish to reduce boost pressure if you're miles ahead and fuel is low.

- Yellow flags prevent you from overtaking (in the paper race), but you can minimise the damage later by moving the car over to the left of the track, and switching on the cruise control. At 80 mph, the camber of the bends keeps the car on the right lines without needing you to steer, but watch out for junked cars on the track ahead. It might not be a good idea to try this unless you're well in front.
- Remember, oil stops and yellow flag traffic jams cause the tyres to cool and the grip to reduce. Fuel also affects weight and therefore steering, so watch it when you race out of the pits after a pit-stop.



MiG-29 FULCRUM

DOMARK / AMIGA/ST £34.99, PC £28.99

This week's prize for unfortunate timing goes to Domark, whose *MiG-29 Fulcrum* takes to the skies in completely the wrong weather for a military flight simulator. Domark's sin is based on the plane which has worried the West for a long time – the Mikoyan Gurevich 29 fighter (codenamed Fulcrum by NATO).

MiG-29 Fulcrum depicts you as a Soviet pilot, at the beginning of your training. To start you off, there's a training area with a target bombing range, a lake with floating and static targets and a small runway which produces an endless supply of Shenyang fighters for you to eradicate. You train until you decide you're ready for real combat. However, in combat missions you are not invulnerable – failed missions must be refuelled from the beginning.

The *MiG-29* is an easy plane to come to grips with, and is a dream to fly. Beginners should learn to fly in the sim's simple mode, rather than its advanced counterpart, as the latter computes aerodynamics to an incredibly realistic level.

Similarly, there is a choice of control devices – mouse, keyboard or joystick. The mouse is the most responsive and accurate and leaves you a hand free for operating the many buttons 'inside the cockpit'. Joystick mode carries a very close second, but is less attractive

primarily because the fire button only works the machine gun. Also, missiles are released via the space bar, often causing a bit of scrambling if you're holding the stick in two hands.

There are five main missions, the first one set, rather chillingly, in the Middle East. You fly a reconnaissance mission to identify a NATO submarine trapped in ice, an incursion into Red China over the Great Wall, an attack on a terrorist convoy, and carry out wholesale destructions of oil refineries, storage dumps and even a fast breeder nuclear reactor!

See Fighters, Shenyangs, Mixages and enemy *MiG-29s* keep tabs on you constantly. However, you can look on to virtually any airborne target which is in range. You select the view from the pilot's seat or the enemy and force the missile systems to track any targets in that direction. You can then return to the straight-ahead view and bank over hard to pull in behind your opponent. The familiar red target-lock shows a good chance of a hit, but most all your opponents require at least two good belts before they go down. As a last resort, you can use the built-in machine guns, but their range is limited to around one kilometre in the air.

MiG-29 meets all the flying standards set by other flight sims. It's as good to fly as *F-16 Stealth Fighter*, and

F-16 combat Pilot, while it's far better than Falcon, *Fighter Bunker* and *F-29 Retaliator*.

However, it has less flashy front-end graphics than most of its rivals and doesn't have nearly such an exciting missions section as *Stealth Fighter*. But the feeling of true flight is unsurpassed. Absolutely every element of aerodynamic principles is covered, without making the plane unflyable.

Sound effects in *MiG-29* consist of explosions, year-over-year engines and a few warning beeps and hysquirts. As for the music, the tune accompanying the intro is pleasant enough, but you're unlikely to listen to it more than once.

The novelty of flying a Soviet warplane soon wears off and before long you are unaware of whose side you're on, what the plane is, or anything other than slaying airm and airborne. Fast, smooth vector graphics whizz by at the beak of the mouse and they are extremely playable.

The missions are exciting and varied, even if they are a little 'standard'. But overall, *MiG-29* won't disappoint you. Its superb qualities of animation and responsiveness make it a tight-sim too good to be missed. If you're a sim-collector, buy it now; if you're new to the genre, check this one out first.



1 Full tilt down the runway, you're seconds from take-off. And the enemy is already lying in wait for you.



2 The unguided missile streaks towards the target building.



3 Your homing missile is spotted by the presence of locking enemy.



4 You pull in hard behind him and prepare for air-to-air launch.



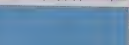
5 The tower watches your take-off, while you watch death.



6 Adbore, you rip away from danger with a climbing turn.



7 Safe over the target range, you prepare for rocket practice.



8 You pull in hard behind him and prepare for air-to-air launch.



9 The tower watches your take-off, while you watch death.



10 Adbore, you rip away from danger with a climbing turn.

11 Safe over the target range, you prepare for rocket practice.

CONSOLE ZONE

B-movie monsters and female Japanese wrestlers are among the crazy characters in Richard Frederick's overview of the world of console gaming this week.

PLAYING TIPS

SEGA MASTER SYSTEM

Go for Galaxy Force planets in this order: green, white, blue and red

NINTENDO ES

Thanks to Martin Wilson from Hereford for this Bubble Bobble passtime to level 37: FLEJJD

ATARI LYNX

The second instalment of ELECTROGOP door passtime:

LEVEL TWO

1: 3187
2: 5409

LEVEL THREE

1: 5284 - Exit to Level Four
2: 7213 - Exit to Level Four
3: 3556 - Weapons
4: 7292 - Weapons
5: 5294

Have you got any playing hints for Sine World? Send them into the usual address.

NINTENDO GAMEBOY

Alas Colson from Birmingham has some more Super Mario Land hints. When Mario can't get into small tunnels try this: go to the tunnel entrance, hold down either [Left] or [Right] then rapidly press [Down] several times. Once you're inside the tunnel, keep [Left] or [Right] pressed and repeatedly press [Button A].

SEGA MEGADRIVE

Restart Strider by pressing [Button A], [Button C], [Button B], [Button C] and [Button A] when the Master is laughing at the beginning of the game.

NEC PC ENGINE

Play Psychoda sounds by simultaneously pressing [Button E], [Button B] and [Select] on the title screen, then push [Start].

NINTENDO ES



• KillerGoes: violence 21st century-style.

Pretend to face your skates and 'fine-tune' your reactions because Ultragames RollerGames has just initiated the net.

Set in the 21st Century, the Madus International Purges and Eternal Rengades have kidnapped the RollerGames commissioner, twisted three towns into lots of destruction, and devised six levels of death traps for you and your own three teams of skate duddos to conquer.

Are you going to hand the cry over to those creepo or will you take the fight to the streets, sewers, jostlyards, highways and parks? Just watch out for the open manholes, non-eating dogs and

skateboard thugs... and that's before you get to the rough stuff!

SEGA MEGADRIVE



• *Coaxed by Japan's top female wrestler Ringo Angels will probably be the best, if not only, female Japanese wrestling sim you'll ever play.*

They're tough. They wear kinky boots. They're Ringo Angels!

In true Japanese off-the-wall style, Aozaki has released a women's wrestling game endorsed by Suzuki. Japan's top female wrestling star. The game has some neat moves in and out of the ring and should appeal to any Mega pinners out there.

Rengade Angels features other famous fighting females from the arena and costs ¥6800 (£27).

NEC PC ENGINE

Do you feel like blowing away enemy soldiers using an Up-Link with handy grenade launcher slung underneath? Operation Wolf is a blood-thirsty conversion of the Tale's popular coin-op.

Just one simple rule to this title... if it's on-screen shoot it!

SEGA MASTER SYSTEM

Forget Robocop. E-SWAT is the latest word in law enforcement.

Slay glad to your weapons through five gaudy levels. You have the ultra-

tech armour and weapons for the job. The question is, do you have the guts for the challenge? E-SWAT is available now for £29.99.

NINTENDO GAMEBOY

Are you tired of Tetris? Tengen and Hudson Soft may have the answer. Akas is another simple but challenging arcade puzzle game which will test your dexterity and spatial perceptions.

You must catch shaded tiles with a paddle and flip them into bins to make rows of three same-shaded tiles in stacks or diagonals. Emission a conveyor belt which increases speed as you play.

Akas costs ¥3500 (£14) on the Gameboy and is also available on the Nintendo Entertainment System, Megadrive and PC Engine.

ATARI LYNX



• *Rampage: relive those 1970's monster movies but this time from the point of view of the monster.*

Rampage. The game that has been around since the launch of the Lynx, has finally been released.

Based on the Bally coin-op, Rampage allows up to four players to become one of four massive monsters with the object of advancing levels by destroying buildings and eating soldiers, tanks and helicopters.

It's a kind of B-movie arcade game for players: trying to become a 60ft beast on a trail of destruction. Larry the Lob Rat is a new addition to the beach of monsters. Rampage is available now retailing at £24.99. ■

THE TRADING ZONE

Are you confused by the huge range of video games out there? Have you ever been stung by a real turkey? Don't worry! Just sit back and let the Zone lead you through the greatest games available on your console. This week we reveal what's hot on Nintendo...

1. SUPER MARIO BROS

Simply the best platform arcade game ever invented and you have the choice of three titles! Travel through endless worlds of adventure as you search for the Mushroom Princess in the original, join the brothers,

Norio and Luigi, in the sequel or play Super Mario Bros 3, the first 3D cart. Look out for the Mario movie coming soon.

2. LIFE FORCE

Conversion hit Konami's masterblaster coin-op, known as Salamander in British arcades. A multi-stage horizontal and vertical shoot-'em-up filled with treacherous tentacles, bubble busters and fierce fireballs. Control power-up pads and reap the rippled lasers. You haven't hit the bizzanca till you're challenged the one-eyed brain with twin grappling hooks.

3. BATMAN

Stop the press, again. The Caped Crusader is back on the streets of Gotham City in a search and destroy mission to end the Joker's reign of terror. Built-in enhanced graphics chip produces dazzling displays.

4. BUBBLE BOBBLE

But and Bob, two crazy bubble-blowing dinosaurs, must search 100 screens of wasteful-collected patterns before their final confrontation with Baron von Blubb. Conversions of the cult Taito coin-op. Voted one of the best video games in

America for its 'attractive graphics, ability to hold players interest and high regard for positive human values'.

5. ROLISTICE

ESG Incapart, part of electronics giant Sony, pays homage to the Ultimate Interactive-3D arcade adventures from the early 1980's. Take on Shadon's quest as you search the deadly fortress of Katanok for the six pieces of the magical Staff of Demons, in a brave attempt to save Princess Eleanor from the evil mage Moribus.

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ATARI ST

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Avagio is a desktop publishing (DTP) program from Union World, in sunny California. In the UK it's handled by LTS. It runs on the PC – everything from an XT on up – but it does need a hard disk. Despite its attractions it has so far failed to impress those on a budget who continue to buy the more familiar TimeWriter from GST. In a bid to alter matters Avagio version 1.2 is selling not at the original £195, but at £119. Do the new features and lower price make it worth a second, more serious look?

Avagio uses neither Windows nor GEM, it does all the graphical support itself. However, it does employ the same basic working methods as programs based on those graphical user interfaces. You'll find scroll bars, pull down menus and dialog boxes all activated via the mouse. Pulling down the File menu to make a start produces one surprise – no lower case letters. Strange to see a design program that only communicates in capitals.

The opening screen is a full page view of the selected paper size. Zoom views are also available to a point where only a few square inches of 'paper' are visible on screen. Also on screen is an optional min-view box and toolbar which are both draggable – they frequently need to be moved when working on zoom views. The min-view is used to move text on any decorated part of the current page.

Text entry on screen is practical for short runs of words, but not for entries of any length. The reason is that Avagio uses scalable outline fonts (soo Vector v bitmapped). This means that every time you type a letter it must calculate a bitmap for it and place it on the screen. A reasonable typist easily outpaces it even at the review machine, a 10MHz 386SX. So it's best to prepare text using a word processor and import it. Avagio will import from most well known word processing packages. It also keeps existing word styles, like bold or italic.

Text is imported into a text frame – indeed, despite its claims to using a paste board metaphor (like PageMaker) you can't drag anything off of the page and on to the background. A link box chains frames together so that imported text will flow from one to another and from page to page.

Getting the imported text looking the way you want is best done using paragraph style templates. These tell Avagio what point size the text should be, what font to use and how to handle the paragraph beginnings and endings (indenting them, lines in between, bullet headings and so on).

Open fonts are supplied with Avagio including the useful Dingbats, a Times Roman equivalent called Bay Roman and a Helvetica done called Helvex. LTS will supply another 50 or so at a cost of around £10 each, though for Avagio Professional users genuine Monotype fonts are available. Fonts will display in around 16 different styles, including outline (below letters).

There is a utility that converts the more familiar Fontware outlines (and others) to Avagio format.

AIM HIGH PRICE LOW

With a lower price and more features is the Avagio PC DTP package all set to succeed? Steve Patient lays out a report.

though, oddly, it can't handle genuine Adobe PostScript fonts. For added interest Avagio will also convert some bit mapped fonts for its own use (though a 12-point bit mapped Helvetica from elsewhere is only usable as a 12-point font in Avagio after conversion).

Along with paragraph styles Avagio supports page templates – handy if you want to produce standard documents like dinner menus, names or club newsletters week after week. A number of these come pre-defined. You can date yours on these or use them as a source of ideas and create your own.

Pictures are also imported into frames. Avagio will run text around them, though not by default, the default is to print right on over them. Avagio comes with a massive library of clip art from Artware Systems (who will sell you even more if you ask nicely). Most of these are in a proprietary vector format (UW) though Avagio now

imports various vector and bit mapped graphics (see panel) including AI (Adobe Illustrator PostScript format), TIFF and PCX. It's worth sorting these out since they occupy some 2.5Mb of disk real estate. Fortunately they are also printed in the manual.

The manual comes in a ring binder and is quite good. There's a reasonable tutorial that's worth working through to get a feel for the program. It's when you get down to the visual aspects, like the Mingle feature, that it can get a bit vague. Mingle enables the contents of boxes to interact. Each box has an effect on the other images. It's a clever feature and useful for logos (and for filling outlines of large characters) but that isn't what a DTP package is for. Pretty graphics are best prepared in a graphics package and imported as graphics. The authors would have done better to concentrate their efforts elsewhere.

For example, many DTP users employ their own printer as no more than a proofing device and have a print bureau take their files and produce high definition professional output from them. There is no provision for this at all and since PostScript or EPS files are not one of the output options, it appears to be impossible to achieve – bear printer quality at the best you can hope for. Still, at least Avagio makes a good, fast, job of printing, even on a dot-matrix printer.

So how does it stand up? Avagio v1 was planned for its death – this one is still slow. On a 386SX you're left twiddling your thumbs while Avagio recalculates every time you scroll the screen or move a box. On an XT it doesn't run – it crawls. All right, that's the price you pay for using scalable screen fonts. It's the price you have to pay if you want font sizes from 6 to 500 in one point increments without buying a 300dpi hard disk. Avagio is great for getting dramatic effects but it needs a really fast machine to do it justice. ■

LTS is on 0385 732617.

VECTOR vs BITMAPPED

Bitmapped graphics – like PCX files – have all the information represented as dots. Vector based graphics hold information in the form of mathematical descriptions. For example, a line is defined by its beginning and end position on the page, not as a series of dots. If a bit image is scaled down information is lost since bits are eliminated. If it's scaled up you get jagged edges on sloping lines. By contrast, a vector image can be scaled without loss of detail.

Fonts are held as either bitmapped or vector graphic images. Since Avagio handles all its fonts as outlines (vectors) rather than as bitmaps it can scale them precisely with no loss of detail, producing very clean displays at all font sizes. There is a massive scaling in disk space too. Only one font outline is needed to produce every font size. A bitmapped font requires a complete set of bitmaps at each size used.



• Working on the first page of Biking Mad, note the use of picture bars to bracket the headline and the way the picture blends into the page edge.



• In preview mode you get a good look at the whole page – or two pages if you're working on a spread – essential viewing if you want your pages to balance.



• The Mingle feature is supposedly easy to use, but getting the most out of it takes a lot of practice. Worth persevering with for those interesting effects.

ST GRAPHICS



Where you splash out your hard-earned cash on any graphics package is a good idea to decide exactly what you want. Are you interested in painting pictures, creating sprites, doing graphics for DTP, or do you want an all-purpose system? Is any one resolution more important, and how much money do you want to spend? There is a bewildering choice available and before you make the decision, it's important to understand how they work.

The ST operates in three different screen resolutions. High-resolution produces the best quality images at 640 X 400 pixels per screen but it only lets you work in black and white, and you need to buy an Atari monochrome monitor to use it. Low-resolution is the artist's choice because this provides you with a choice of 16 colours from a bewildering palette of 512, though the screen resolution is only 320 X 200 pixels. Medium resolution is a compromise offering 640 X 200 pixels with four colours from the same palette of 512.

These are packages which can expand this choice but if you're looking to use the graphics in your own programs, forget these. Getting those extra colours is extremely difficult. Consider how a picture is displayed: a beam of electrons scans across and down the screen; one frame consists of 200 lines of pixels, and 50 frames a second are sent to the monitor. That means one complete line of pixels is drawn every 1/10,000 of a second (every 100 microseconds).

The trick that these draw programs employ is to synchronise themselves with the scanning speed of the display. You can still only have 16 colours on screen but when the electron gun reaches the end of one line it flies back to begin drawing the next line down, so there's a very brief period during this flyback (a few microseconds only) when nothing is actually being drawn. The secret is to change the ST's colour palette during the flyback. So, one palette of 16 colours is being used to draw one screen-line, then an entirely different palette can be used for the next and other screen lines. You can only have 16 different colours per line, but you can change which 16 they are for every line.

In the graphics department, more than any other, there are a range of excellent Public Domain art packages and utilities which can rival many commercial programs. For example, Am-ST is an animation program which cost in excess of £50 before it was launched into the PD. Neochrome is a PD drawing package which is still many games programmers' favourite for designing sprites. Breaking into the kaleidoscopic world of graphics can cost as little as £2.50.

NEOCROME

£2.50 • DISK 150 • SouthWest Software Library

This was originally with the ST and different features are now available for different versions. This particular version came with a full manual on disk, it is the chosen paint package for many programmers who want to design sprites or loading screens in games because its images are stored in a very simple format.

Although Neochrome only runs on colour STs, it has all the features found in Degas Elite. The work area is restricted to a small area of the screen with the Neochrome status bar underneath. You can expand the drawing window to take up the full screen, but then the status bar must be called up using a keyboard.

The commands or other include standard painting

The variety of graphics packages available is ever increasing - Mark Higham helps you make the right choice at the right price.

and drawing tools. A list of sixteen colours are presented at the bottom of the display and you choose the one to draw in. This colour can be selected from a palette of 512.

One draw feature is the way the scraper enables you to 'draw' an area of the screen you want to cut out and then use it as a brush for making wild patterns.

An excellent package and if you're thinking of designing graphics to use in your own programs, you should be considering this one - however much money you've got in the bank.

CYBER PAINT

£29.95 • Electronic Distribution • 0480 436656



Although strictly speaking this is an animation package, it also has some excellent paint facilities. Its design as an animation system means it only works in low resolution and with a minimum 1Mb of memory.

What's useful about Cyber Paint is that you can use the animation frames to store different versions of an image. You could easily have 20-100 images in memory depending on just how different they are from each other. The animation compression system only stores the differences between images and not whole 32K blocks. Its load and save options are very comprehensive, loading screens and blocks in various formats as well as animation files, palettes and masks.

If it has any limitations they are that it can only deal with screen size images and it has no patterned flood fill - a strange omission. Great for animation, and good for painting pictures.

ANI ST

SOFTWARE, Disk: ART 25 • 0705 266889

Am-ST, previously known as Aegis Animator, written by Jiri Kent, gives you animation options not possible with any other package.

All other animation software on the ST uses sprites - drawn images - which you must generate in order to produce animation. Am-ST doesn't base its animation on sprites, though they may be included if you desire. Images are constructed from objects, lines, circles, stars and so on. The objects are stored in a list together with their size, colour and position and the animation is created by changing those factors. The software takes up a table of ingredients for each frame in the animation and creates that picture.

The things this system does best are transformations - from one shape to another. It achieves polymorphic animation using an in-built function called 'bending'. This means you only have to create the key positions in the animation and Am-ST generates all the frames in between.

Unfortunately it can't do detailed animations. You wouldn't consider trying to create a character animation using Am-ST, it's just not suitable. However, you can produce complicated sequences which occupy little memory or disk space.

DEGAS ELITE

£19.95 • Electronic Arts • 0462 420847



One of the earliest packages available for the ST, Degas was soon followed by the more sophisticated Degas Elite. The style of Degas combined simplicity with functionality. Both programs were written by Tom Hudson, who has since gone on to write CAD and much of the acclaimed Cyber Series.

Degas Elite operates in all graphic modes and can convert images between them. It can load a large range of formats, but only exports screens in its own compressed or uncompressed Degas structure. This is not a problem, however, since Degas has become the industry accepted standard for picture files.

Among its plus points are a good zoom, keyboard shortcuts, block save in IFF and colour cycling to provide limited animation effects. On the negative side is reliance on the ST's built-in GEM functions for many facilities, making some graphic operations painfully slow. Apart from these complaints this is an extensive package with many supporters. ■

Mark Higham is editor of ST Format magazine. These articles are reprinted from his book. Get the most out of your ST, available from Future Publishing Ltd, The Old Barn, Somerton TA11 7BR. Price £9.95.

Now, there's a PCAT compatible that not only solves problems like other AT compatibles, it also solves the one problem that its predecessors have created — affordability.

Silica Systems are pleased to present the new Atari ABC. The ABC is a 286 AT compatible that runs at over 5 times the performance of the IBM XT. This is achieved by combining the power and speed of a 16-bit 286 processor, with Atari Corp's development experience and engineering capabilities, which use the very latest in design technology. However, the Atari ABC's are available at "XT prices" and many XT owners will wonder why they paid more, but got less!

The ABC is a reliable, high performance computer, built to exceptionally rigorous standards. It is well designed, to a state of the art specification, maintaining maximum expansion capability for the future. This includes up to 640K of RAM and 3 AT expansion slots. Plus, unusually for a PC at this price, the ABC has the ability to install two or three extra drives, with the cabinet already inside the CPU!

The ABC has a host of impressive features, all built in as standard, encouraging simple installation and ease of use. In addition, the ABC's small footprint and quiet operating means that you will notice it less on your desk than other PC's. Except, of course, when you begin to take advantage of its AI power.

At its remarkably low price point, the ABC is ideally suited for home, office and educational use and will take full advantage of the vast range of PC compatible software. And, with 12 months FREE on-site maintenance (9 hour response), you can rest assured that your ABC will be fully supported.

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TECH TIPS

Is your soundcard dumbstruck? Don't you put your Amiga in the picture? Does your Arch need a new driver? Is your vision blurry? Send your sorry stories to Tech Tips, Beauford Place, 30 Mogmouthe Street, Bath BA1 2BW

■ HELP! Drive selector

I have an old Atari ST/M with two external drives. They are both double-sided drives, purchased from Evesham Micros. The drives have not got through ports and so only one can be connected to the computer at any one time - now you can see my problem.

I used to have an Atari ST254 single sided drive, this had a through port which allowed me to plug in an extra drive. This set up suited me for a while, but since I do a lot of programming (I'm a computer science student you see and peer at that) I needed to move on to bigger and better things. Unfortunately, I am now in a worse state than when I started.

Would it be possible to make (or preferably buy) a lead which plugs into the disk drive port on the ST which would split into two sockets to allow me to plug in both drives. I noticed in the ST Owner's manual that pins 5 & 8 select respectively, so I would assume that such a lead could easily be made to do what I require.

Additionally, how can I stop my computer from continually resetting when my mouse (SM125) is plugged in? It seems when you least expect it and can be downright infuriating (that's putting it mildly), this letter had to be re-typed three times inside ten minutes.

Why not have a MSMHSKT223

debater! (My Lord MS has softer keys than your ill Spectrum)

Yours (just bling waiting in suspense, needing a solution pretty quickly before I fall by degrees) faithfully,
Paul Gregg, Acton, Northern Ireland

The answer to your drive selector is the Microstyle Drive Switch Cable. This is a two way switched cable that allows you to connect two drives to a single socket. Ring Phil Craven on 0274 626652 for more details.

The real problem sounds like a hardware hassle best sorted by a competent engineer. Take the computer and monitor to the place that you bought them and get them checked.

■ HELP! Epson suits

I need a disk drive for my computer. The problem is I do not know where to buy one from. I asked in many shops but they did not have the model I need. Please help me to get this disk drive. The disk drive model is 2.5-Inch Epson SMD 480L.

Thank you for your help.

Khumun Chohan, Middlesex

You could try ringing Epson on 0442 61144 for the information that you require. I regularly get letters such as the one above with questions that can be

answered by a simple phone call to a manufacturer. Before you put pen or word processor to paper, think of the time that you could save if you did one of the following:

- 1 Ring the company
- 2 Read the manual
- 3 Check the installation and connections.

These three troubleshooting hints could get about 90 per cent of the people with problems started without the wait between writing letters and seeing it published.

■ THOUGHTS! PC purchase

Thank you for your helpful advice about the choice of an upgrade for my Commodore PC-1. In fact, the upgrade I have in mind is not an Amstrad but the latest Viglen Genie 1 which was given "Best Buy" rating in the latest Which PC? magazine.

However, despite the good value claimed for such a high spec 286 perhaps you will understand my reluctance to jump into the considerable expense involved when you compare it with the Amiga 500 with its very good graphics and sound. With the Amiga I'm currently helping a friend to learn to fly the Cessna 182 using Charles Gulick's splendid co-pilot book, *Flying Flight Simulator II*.

I bought the later F54 for the PC, but it became apparent that in spite of all the extra features - random weather generator, plane design facility, Salford, and much finer graphics detail - nothing short of a 286 with Super VGA colour could make it come anywhere near F54 on the Amiga for realism and speed of graphics handling. This must surely have a lot to do with the more advanced technology of these machines - and reading about Windows 3.0, it seems that even this needs larger and/or better memory handling than 640K of even 1Mb can provide - the push is towards a 386. And even then, no sound and - Wow! what an empty pocket!

Perhaps we ought to wait until Apple's RISC chip has found its way into a new low-price Mac Super Classic? But seriously though, what are the pros and cons of mail order purchase? My local dealer is so helpful and always on the spot John Gray, Eastbourne, Sussex.

You've answered one of our own questions by saying that your own dealer is often helpful and on the spot. On the down side, purchasing from a mail order house means that you aren't normally able to try your machine before you buy it and ask questions head to head with the person selling it to you. If there are problems at a later date, your local

■ HELP! True colour

I run an office newsletter for a small company. We have been obliged by a new company and the new management want to expand the newsletter into a corporate paper.

By default I have been given the job as I'm the only person in the group with any experience of even a newsletter. The salary is fine and I've been given enough budget to buy an Apple Macintosh, laser printer and a lot of useful software.

A month playing with all this stuff has made me quite familiar with the Apple and I'm progressing at a rate that suggests that the Mac is a fine productivity tool.

My only problem at the moment is illustrations. I am having to paste pictures, photos and diagrams on to the page and then send the page to the printer. The printer's chieftain says that a scanner will do this job when I can send them a disk which is quicker. He said a colour scanner would be good as this would give us the opportunity to produce a professional-looking colour paper.

I want to go with this but the £4,000 I've been quoted

for a scanner is too much. I don't need to scan large areas, but the quality is important: is there anything that would get me along as a stopgap? Mine would do, but colour would be better. I don't want to spend more than £200. Am I asking too much?
Wm Townsend, Leicester

Cast your eye back to page 71 of issue 113 of *Express* and you'll see a review of the Sharp JX-100 colour scanner. This £345 colour portable scanner will do the job that you want and comes well within your budget. Software and cables to interface it with a colour Mac II or above is available from P&P on 0706 217744.

Unfortunately you'll also need special software to produce colour separations for the printers which costs several hundred pounds. If you want to know more about colour on the Mac our sister magazine *Macworld* is running a series on the subject. Phone Catty Asdman on 0458 74011 for details of selling a copy.



• The Sharp JX-100 colour scanner produces a professional job.

dealer is close enough and accessible enough to kick. If you have a problem with a mail order company, it can cost a lot in telephone calls and correspondence to get things sorted. A local dealer can be chivvied along by a regular (and cheap) call at the premises.

There are advantages of buying from a reputable mail order house, though. Mail order is generally cheaper than buying from a retailer. Quite often you will be able to buy a well specified piece of equipment for a reasonable figure. A mail order house may specialise in one particular area of computing and be able to supply a far greater range of its speciality than stock.

In the end, it comes down to your needs and cost. If you are likely to need constant and local support, stay with your friend and trusted dealer. If you have the knowledge and the ability to be a self-starter, and want to utilise your cash efficiently, maybe mail order is best.

■ HELPI! Fallen Archies

Please! Please! Please!!!! Can you help me with this little problem of mine?

I am hoping to get an Archimedes A3000 (all rock bottom price) (I had better tell you where I can get it) (I had not got much money to spare so I can not

afford a monitor until next Christmas (or whenever I can afford it) as I wanted to use it without a monitor.

In a previous issue of Express you had an article about a TV monitor for the Archie. This only came in a package from ZOL that cost over \$500. As I have mentioned before I have not got that amount of money so I was wondering if you could help me find a firm that sells a TV monitor for all of its lifetime set.

Give dear old Mr Steven Griesen an applause after his brilliant article in issue 108 and I also think he deserves these cheers from every Archimedes lover.

Yours Hopefully,
Julian Roberts, Fordebridge, Hants.

A 16-day safari to the fenslands around Cambridge was unable to run to ground the piece of kit that you require. If any one out there knows of a monitor for the Arch that won't break the bank, drop us a line.

■ TIP! Fried enthusiast

Just point an safely in your Circuit City shop telling article fit an AtForce card. Strapping yourself to a full earth (with whatever you don't specify) is extremely dodgy where electricity is concerned.

Being a BT maintenance (exchanges)

engineer I am equipped with wrist straps and nice curly cords, but the cords are 2 megsOhm resistance so that nobody gets fried in the event of a mistake.

Chaining yourself to a radiator or central heating pipe or even (God forbid) the ring main earth, may be OK for you, but I think you really should explain to the lesser tech type about ESP (electro-static precautions).

Also worth a mention is when using a soldering iron 'temperature controlled' is a byword. I have some badly wrecked kit which has had the benefits of somebody's 3,000-watt heavy duty soldering iron.

Nice columns, shame about the mosquitoes. Keep up the good work.

Mike Jones, Skelmersdale, Lancashire.

Firstly, I don't advocate anyone working on live equipment unless it's their job and they're trained for it. All of the jobs to be covered in Circuit City are possible without mains power being present.

The point of wrist straps and self earthing is so that there isn't a build up of static in your body. To test for the effects of static, try walking around a room with a nylon carpet for a couple of hours and then earthing yourself on a central heating pipe or metal radiator (soldering - ouch!). Imagine what that bolt of static

electricity could do to the traces of a microchip and you'll know why we use the wrist straps.

Temperature controlled soldering irons are a good idea and a convenience, but it's quite possible to manage without one. A former REME corporal of some 60 summers aware by his three pound weight iron that must be warmed to cherry red in a gas flame before use. To watch this chap eldritch mending the insides of TVs and radios while dipping thick solder in powdered flux is a joy.

He says that he can't get used to the new longed electric irons and does a better job with his prehistoric kit than I can do with my modern iron. Like many convenience products, the temperature controlled soldering iron makes the job easier and more precise. I can't help feeling though, that it's a better idea to learn to do the job with an ordinary iron and graduate to the temperature controlled one. This way, you will always be able to use an ordinary iron if that's all that's available.

A straw poll of my colleagues here at Express who have to look at my mistake every day suggests that there's nothing wrong with it, although Production Editor Julia Tolley does insist on its regular trimming. ■

■ STOP PRESS! Christmas cheer

Now that Santa's gone back to the North Pole and the advertising men have put away their superlatives until the autumn it's time to have a look at some of the problems that turned up on the Express Christmas helpline.

The first cry for help came at seven in the morning on Christmas day and a puzzled voice told my answering service that he couldn't persuade his Amiga to part with any of its wonderful stereophonic sound. At that time of the morning I hadn't made the metamorphosis from duvet to dining rosette so the solution had to come later.

Between breakfast time on Christmas day and midnight on Boxing day there were over 70 calls of which nearly 40 were Amiga owners, over 25 ST and the remaining handful were made up of a couple of CSAs, a couple of PCs some 8-bits and a peripheral.

AMIGA PROBS

The most common problem with the Amiga was lack of sound. Most of the callers wanted no more than a bit of blood curdling sound to go with their favourite shoot-'em-up. The majority were using the Amiga with a monitor and the problem was caused by not connecting the audio output of the Amiga to the monitor. Where people had bought their Amiga second-hand, the small Y shaped cable was generally missing. Of those with a new machine, most hadn't realised that the cable was necessary.

Other Amiga problems included an incompatible monitor, a damaged modulator, and worst of all, a well meaning 'helper' who didn't understand the Amiga. This incident was caused by a neighbour (PC expert) being called in when the shiny new Amiga wouldn't work. The expert diagnosed a problem with one disk as a virus and insisted on virus checking the entire batch of 120 plus disks. Surely enough, the virus killer being used couldn't recognise the bootblocks of copy protected games and

the expert used the virus killer to 'fix' them all. Not result, over 80 ruined games. That's proof positive that you should make sure your expert knows about the computer that you let them loose on.

ST STUFF

Proud owners of new (and newish) STs were almost unanimous in stating (in with application problems. The G20 environment was a puzzle to those more used to a command line environment and printer hassles came high on the list of problems.

This highlighted one of the growing problems with home machines becoming powerful enough to run high level applications.

Not enough trouble seems to be taken at the point of sale to ensure that new users are made aware that applications often need installing and configuring. Someone who has only ever run games and simple programs that merely involve the insertion of a disk can easily run into problems when they are confronted with a program with pages of installation and configuration options.

The installation of applications is generally covered in the manual but still received several calls from people who were stuck. One caller had followed the installation menus for the Protext word processor, but had run into difficulty when his printer didn't appear in the default menu.

He was a sensible fellow and had backed up his program disks and so was using only working copies. With a little encouragement, he went through the installation procedure trying each of the available printer drivers. It wasn't until he found one that would work.

He'd been wary of trying this at first but using only working copies, the worst thing that could occur was that he would have to re-copy the disks if they became corrupt.

PC CALLOUT

PC users seemed to have calmed for themselves very well with only two Christmas queries. The Rawliffe family had settled down to play a game of Jack Machine Golf on the PC (borrowed from dad's office over Christmas) but couldn't persuade the game III work. After having the complicated and pedantic copy protection wheel explained, they were into the program but ran back when the super 386 VGA machine only offered four shades of black, white, blue and purple.

A tip through the manual had the game re-configure and the Rawliffes teed off with the Golden Bear.

A slightly more serious problem was a PC that 'smelled of burning' and had sparks coming out of the back. After assuring that the machine wasn't plugged into the mains the owner opened it up. This is generally possible with a PC because of the expansion capabilities. Once inside a piece of metal pecking strap was found causing a live short between two terminals. Once this was removed, the owner was advised to have it 'looked at' by an expert, but chose to power up again anyway. It worked and he was in business.

THE BEST

The remaining calls were of all and sundry. A PCW owner wanting to get on-line with a modem, a CPC owner with cartridge problems in name but a couple. The final call came very late in the evening from an insider who just wanted to wish a merry Christmas. ■

The volume of calls and the fact that we could solve most of the problems meant that it was worthwhile. Thanks to everyone who rung and special thanks to Patricia for the Christmas pad recipe she emailed for my Amiga hard drive solution. Get writing the letters to Santa and all being well we'll run the Christmas helpline again in December 1991.

AMIGA GRAPHICS

There is no machine that can quite match the Amiga, for powerful graphics, coupled with an ease of use that brings this power to your fingertips. You only have to look at the graphics in games for proof – and even these are created using one of the popular graphics programs.

The obvious place to start on the graphics scene is one which will be familiar to nearly all Amiga owners nowadays. If you bought your Amiga in any of the recent A500 bundles from Commodore, such as the Batman Pack, the Flight of Fantasy pack or the Sonnet Game pack you will have acquired a copy of Electronic Arts' Deluxe Paint II with your machine. If your Amiga is older, you will no doubt have been unable to own it for long without being tempted to buy Deluxe Paint.

This really is one of the best graphics programs on any computer. Most games writers use it to draw the graphics for their games and, because it uses a standard file format common to all Amiga products – IFF (Interchangeable File Format) – to store pictures, they can be transferred between programs and even into your own programs with ease.

Deluxe Paint has done more for the Amiga than any other product – after tinkering with it, so many people who bought an Amiga just to play games on have realised that there is a whole lot more to their computer than just games. It has opened the door for many people to the other uses of the Amiga, known under the generic headings of 'productivity' or just plain 'creativity'.

A WORD ABOUT SCREEN DISPLAYS...

The Amiga has a total colour palette of 4,096 colours and a number of different screen modes or display modes. Before we go any further, it might be a good idea to explore these a little.

The basics can be explored by playing around a little in Deluxe Paint. On the opening screen you have options for three screen resolutions – low, medium and high, often referred to as low-res, med-res and hi-res. Normally in these screen modes a maximum of 32 colours out of the Amiga's 4,096 total colours can be displayed at one time.

The next two steps up are both a bit of a cheat. The first is Extra Half-Byte (EHB) which allows up to 64 colours on screen at one time. In actual fact these are the same 32 plus another set of half the brightness of the original set, but it gives a workable extra 32 shades. The other cheat is Interface mode, which imitates a screen of twice the resolution by flicking between two slightly offset screens.

The final display mode is HAM. This cheats completely, calculating each colour on-screen by comparison with the one next to it. It is a very clever, though, and actually allows all 4,096 colours to be used.

BITMAPS AND PIXELS

The display on a computer monitor is, in effect, an array of tiny lights arranged in horizontal and vertical rows. Each light can be any one of a range of hues and shades, or off; so almost any image can be composed on the screen by varying these colours. The lights (or PIXELS – Picture Elements) are each controlled by the state of one byte in the computer's screen memory map; so the display is called bitmapped.

All graphics programs use the bit map to display representations of their final output, but paint programs



operate by manipulating this map in a vast range of ways to transform the screen directly, usually almost instantaneously. This technique could be called screen painting.

Recent developments include surface and contour mapping where a section of the 2D bit map is bent and re-mapped onto a representation of a 3D surface, with a range of shading to give the effect of texture and contours.

RECOMMENDED: SCREEN PAINTING

Deluxe Paint II • £79.95 • Electronic Arts • 0753 46442.



• The familiar face of Deluxe Paint II. If you get version II live with your Amiga pack, think about upgrading to DPaint II for the amazing animation facilities it has.

It really has no competition when it comes to straight Amiga paint packages. DPaint II operates in all Amiga screen modes up to 64-colour EHB and allows incredibly sophisticated techniques of shading and perspective to be used. Big change from the earlier versions is the animation facility, which makes it easy to construct complete little animations. If you have DPaint I or it already, get the upgrade from Electronic Arts at a reduced price.

RECOMMENDED: HAM

Phoron Paint 2 • £89.95 • Software Business • 0460 466487. This has become one of the primary tools for screen painting in the Amiga's quality animation mode, HAM. Equally, Digipaint 3 (06895 Precision 071-330 7160) provides serious competition for Phoron Paint in the HAM department, but the two programs are very closely matched.

Spectracolour • Coda/Angle • UK distributor and price as yet unconfirmed. This is the latest release into the HAM market and promises to set new standards with its Deluxe Paint-style animation facilities.

We take a look at all aspects of Amiga graphics from paint programs, HAM painting using 4,096 colours, 3D modelling and ray-tracing to animation.

including the use of the famous 'antimush' method employed by DPaint. It's too early to say much about this, but it could have vast impact on the HAM paint market.

DIFFERENT BALL-GAME – RAY TRACING

Given the Amiga's great processing power and a huge amount of balance, you can move up to the state of the art in computer graphics. Ray tracing is the technique used to create flashy, shining steel and gold logos for television adverts and also to make the famous 'shiny silver ball' bouncing around on a chess board' demos by which the Amiga's power is often identified.

It works simply by constructing 3D models based on co-ordinates, setting where a light source is to come from, and then calculating the paths of rays of light by complex mathematical formulae. Ray-tracing can be an expensive hobby, so do a bit of research and talk to your local dealer before you get too hot.

RECOMMENDED: RAY TRACING

Script/animate 4D • C88 • Byte By Byte.



• Something to explore in. The possibilities offered by ray-tracing vary from the realistic to the weird. This is Script/animate 4D, the demo package but expensive for beginners.

Probably the most powerful 3D modelling system for the Amiga. It uses the same basic interface as all the Script series, three windows corresponding to x, y and z or up/down, east/west and north/south. S44D has many new modelling tools including helical spins and the ability to build and store macros. ■

Danien Noonan is editor of Amiga Format magazine. These articles are reprinted from his book, Get the Most Out of Your Amiga, available from Future Publishing Ltd, The Old Barn, Sawston TA11 7DR. It costs a very reasonable £2.95.

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ONE TO WATCH

Private Eye is the world's smallest monitor; so small you wear it. Stuart Anderton donned the headset...



• The headset sits comfortably with the monitor firing over either eye.

Screen technology is becoming smaller and smaller. LCD systems can now deliver tiny colour screens – in the office as I write this two 3-inch TVs are relaying the news on the Gulf War – but the images are fuzzy and unsuited for computing, aside from arcade games.

Reflection Technologies has taken a different approach. Its device, called Private Eye, is monochrome, but has a much higher resolution than an LCD system, producing scenes of the clearest, sharpest text and graphics you are ever likely to see. And it is small; the display is about three-inches long with an inch-square cross section.

Having a display that small creates problems in itself; how do you get it close enough to your eye to see? Reflection has solved this by attaching the display to a headband which allows it to be suspended immediately in front of your eye. When you wear it the display appears to float before your eyes, about the size of a 12-inch monitor viewed from fractionally too far away.

LED ON

The technology behind the Private Eye is ingenious. At its core is a line of tightly packed light-emitting diodes; 280 of them in a vertical row less than an inch long. A mirror reflects the line of LEDs into a lens and from there to your eye. The clever part is the mirror; it vibrates at its resonant frequency which makes the line of LEDs appear to move rapidly from left to right, then back from right to left. By carefully timing the vibration of the mirror the pattern drawn by the LEDs can be controlled to draw the screen.

Because the LEDs are so tightly spaced, and the speed of vibration so fast, the light from the diodes does not appear as an array of dots but as continuous lines. Text in particular has an almost vector-graphics appearance to it rather than a bitmap, and the bright red LEDs

give an extremely high-contrast display with an amazing clarity and stability.

USING THE EYE

Because the array of LEDs is vertical and the scan of the mirror goes in both directions, the Private Eye cannot be driven by a conventional display system. Normal systems scan a single dot from top left to bottom right, not 280 dots backwards and forwards. The device therefore needs a dedicated video system, and the easiest machine to develop one for is the IBM PC, which has its graphics sub-system on a separate expansion card. A PC version is the one reviewed, but there is no reason in principle why an interface card couldn't be developed for any machine with an open architecture; Amiga Zorro and Mac NuBus cards should be particularly easy; STs would provide more of a problem.

Fitting the device to a PC is simple enough if the Private Eye is your only monitor; you plug in the graphics adapter card, set the PC up to expect a colour CGA card, attach the display and switch on. My PC refused to recognise the Private Eye as a CGA monitor, but it worked fine once I over-rode the error message. Any software which works with CGA will work with the Private Eye, although you lose some of the 720 x 280 resolution – only 640 x 200 dots are used. I ran AutoRoute, PC Globe, and even Windows 3 without any problems. Microsoft Works was fine too once it was reconfigured for monochrome.

A few more complications arise when you attempt to run two monitors at once. MDA, Hercules, CGA and monochrome EGA systems can co-exist with Private Eye in its CGA compatible mode. Colour EGA and VGA systems require that the Private Eye is switched to its own proprietary 720 x 280 mode which is not compatible with graphics software. Various jumpers must be set to make the two graphics systems work together.

USES FOR THE EYE

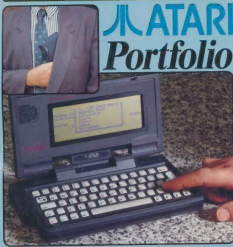
So what would you use a high-quality extremely small display for? When attached to its headband the Private Eye acts as a head-up display which can convey any information which can be displayed on a computer screen. Applications suggested by Reflection Technology include displaying information as an on-line manual while working, building a pocket computer terminal in combination with a miniature modem, and building the display into palm-top computers. We'll have to wait and see if this kind of head mounted display catches on; the technology works and the display is sharp and clear but it will require a new way of thinking as far as software developers are concerned. The Private Eye is one to watch. ■

The Private Eye is distributed in the UK by EMSB on 0438 78241. Private Eye PC developers kits are available for £371.

TECH SPECS

Display type: LED array using vibrating mirror.
Resolution: 720 x 280, 25 lines x 88 characters.
Image size: 21.8" x 14.2", equivalent to 12-inch monitor from two feet away.
Size: 1.2-inches x 1.3-inches x 3.5-inches.
Weight: 2.25oz.
Cable: 5 feet.
Refresh rate: 50Hz.
Data rate: 30 screens per second.
Software compatibility: CGA software.
Hardware compatibility: Co-locata with MDA, CGA, EGA, Hercules, VGA, MCGA.

**THE PC
IN YOUR
POCKET**



And, because Atari's Portfolio is PC compatible, it can communicate with your desktop PC at home, or in the office. You can transfer files from one to the other, to enable you to update your reports and figures with the Portfolio while you are on the move.

FOR ONLY

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WAPIT

- **Processor:** Intel® i7-3540M
- **Operating System:** Compatible with MS-OS 2.0.
- **Internal ROM:** 256M, configurable BIOS, configurable system
- **RAM:** 4GB with an internal RAM slot, configurable from 4K, External memory up to 8GB, RAM
- **Keyboard:** 61 keys, QWERTY, IBM PC keyboard
- **Mouse:** 3 buttons, 1600 dpi, USB, compatible with external disk
- **Character Set:** Extended IBM ASCII (155 characters)
- **Main storage:** option for solid state memory cards (SSD) or hard disk
- **Display:** 10.4" LCD, super-high-resolution, IBM compatible, 10 columns x 9 lines, 340 x 94 pixels (with 320 x 240 resolution), 60 Hz, 800 x 480 pixels (with 800 x 480 pixels) display
- **Peripherals:** 60 pin expansion BUS to tape reader and parallel ports and memory expansion units
- **Start up:** 20" x 10" x 10" (508 x 254 x 254 mm)
- **Weight:** 1.45 kilograms (with battery)
- **Applications:** controller and driver, keyboard and phone, IBM, Lotus 1-2-3 compatible spreadsheet, text processor

SPREADSHEET
For real calculating power, Portfolio has a Lotus 1-2-3 compatible spreadsheet built-in. It has 107 columns x 220 rows and read/write Lotus V1.0 and V3.0 files, so you can transfer data and from Lotus 1-2-3 on your desktop PC. The Portfolio 256K ROM includes MS-DOS and PC DOS compatible systems software.

In addition to the excellent software built-in to the Portablo Plus of Charge (see right), other software and peripheral options, such as the sophisticated Pocket Finance package and word-processing software, are available. And it doesn't stop there. Many manufacturers have recognized the potential of the Portablo and have already started to design new peripherals and software. Procton's recently unveiled development include: Serial interface bus; built-in modem; Apple Macintosh interface; business, utility and programming software; and a range of expansion and built-in peripheral packages. For further free details on the Portablo Plus, log on to the company's website and visit us at: www.silicon.com. See you there.

Partners can store and retrieve data and programs by means RAN, a non-volatile read-only memory, also that allows retrieval of past data. The hardware consists of three chips, 20K, 40K and 160K, so you can store 10K of data in your pocket. The card lives also 10,000 hours, which can mean considerable life to most software.

Parrots, it is pointed out, have a remarkable ability to tune up to go on with normal use, as birds that have a wing or a leg amputated still manage to take their place in the flock. In the case of birds, the ability to adapt to the loss of a limb is not a matter of adaptation or adaptation, but a matter of adaptation. A bird's own learning and memory bank up ensure that information is not lost when the bird's own changes.

to provide a growing range of peripherals (in a built-in or as an add-on module). Peripherals available include serial or parallel modems and memory expanders (in 16MB, 32MB, 64MB, 128MB and 256MB). To find out more, call 0800 404 404 or visit our website, <http://www.pc.ibm.com>.

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Before you decide whether or how to use Intel's new processors, we suggest you first identify what WHERE you want to run your applications. If you're looking at running them on servers, you may require additional bandwidth or software, or need to address what your new hardware can do. And, will the companies you hope bring business to you actually be able to handle your needs? At SILCA SYSTEMS, we know that your choice between Intel's Pentium® III and Pentium® Pro processors is a critical one. So we've put together a checklist to help you make the right decision. This knowledge has been painstakingly researched to provide it to you, the small-business owner, as well as our business and education partners. We have never made such a commitment before.

Intel has announced several key changes to its processor technology. These include:

- An increase in overall performance of up to 60% over previous generations
- A reduction in power consumption and heat output
- An increase in cache size

These are all great improvements and represent, in our view, the most significant advances in microprocessor technology in years. But there are some caveats concerning which is a good fit for you. Not everyone needs the same level of performance. And, if you don't need the extra speed, you may not want to pay for it. So let us help you sort it out. Consulted and reviewed by more than 100 leading industry experts, our latest Price Performance Index attempts to summarize the "Silica Systems Balance."

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Toll (Home)	Toll (Work)
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Candidate Name: _____

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which computer(s), if any, do you own?

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